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ECONOMIC RESEARCH GROUP WORKING  
PAPER NO. 6

Simulating the Employment Impacts  
of the Urban Coalition's  
Counterbudget

By  
Roger H. Bezdek  
James G. Scoville

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ECONOMIC RESEARCH GROUP WORKING PAPER NO. 6

SIMULATING THE EMPLOYMENT IMPACTS OF THE  
URBAN COALITION'S COUNTERBUDGET

By

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October 15, 1971

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## ABSTRACT

This paper describes a large scale computer simulation conducted to determine the detailed manpower effects which may be generated by implementing the Urban Coalition's recommended reorderings of national priorities and Federal expenditures in the period 1972-1976. The procedures followed in each stage of the analysis are specified in detail. The economic model employed is an expanded open input-output model transformed into labor units and integrated with industrial and occupational manpower data. Simulations are run to determine the differential employment impacts which would be caused by the Urban Coalition's budget priorities as opposed to the anticipated expenditure distributions being forecast for the near future. The findings indicate that the Urban Coalition's Counterbudget may cause such drastic dislocations in the labor market that its implementation may be infeasible.



## ACKNOWLEDGEMENT

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## CHAPTER I. TOWARDS A MANPOWER ASSESSMENT OF REORDERED PRIORITIES

A century ago, Leon Walras in his celebrated Elements of Pure Economics took the first steps toward specifying the types of equations which form the system by which our economy is held together. Over the past quarter-century, great progress has been made in estimating the empirical coefficients which, in input-output analysis, form the heart of a linear approximation to that underlying system.

The paper summarizes an attempt to extend further that line of development in the service of improved public policy. Its core is the central relationship of the modern input-output approach--the relationship between the final bill of goods available for public or private consumption and the total outputs which every sector must generate. The first improvement developed in this study builds on earlier work by Bezdek in which more detailed and accurate industry demand estimates were generated from narrowly defined government programs. The second improvement lies in tying detailed industry output forecasts to detailed manpower demands. Together, the model presents a unified picture of the process by which patterns of final demand for output are translated into configurations of demand for manpower of various skills and abilities.

Conceptually, the model is straightforward. The major difficulties are empirical, particularly in the area of reconciling the industrial and occupational classifications so that the separate components of the model will fit together as neatly in practice as they do in theory.

The development of this extended system is of considerable impor-

tance for public policy analysis. Using its relationships, a variety of proposed or projected distributions of final output among competing public and private uses can be examined to assess the differing impacts on labor markets. The dislocations involved can then be judged and the feasibility and internal consistency of major shifts such as those proposed by the Urban Coalition can be appraised. When, in the future, this can be done swiftly and cheaply, the empirical model will represent a major step forward in the tools available for policy analysis.

Of course, such a sweeping claim is premature at this point. Subsequent chapters show that available data and classification schemes make the empirical application of the model only approximate and often at much higher levels of aggregation than would be desirable. Despite the tentative nature of some of the results, the importance of this extension of the traditional interindustry model can be measured by the noticeable increase in analytical power from that described in Chapter 22 of Counterbudget to that of the present report. Detailed projections can now be made for specific employment categories at the industry level, the short-run implications of dropping the Administration's budget in favor of the Urban Coalition's 1972 budget can be evaluated and the longer-run effects to 1976 can be assessed.

The authors are indebted to the Urban Coalition for its interest in and support of this project. Not least among their contributions was an alternative budget which could be subjected to the scrutiny of our model. In addition to our primary goal of evaluating the manpower effects of Counterbudget, the established feasibility and utility of the extended analytical technique must be considered as important as the estimated detailed impacts of the Urban Coalition's proposals. Our findings should contribute simultan-

eously to public discussion of Counterbudget and to the development of improved methods for analyzing social programs.

## CHAPTER II. NATIONAL PRIORITIES AND MANPOWER REQUIREMENTS

An important issue to be considered in any reorientation of national goals and priorities is the manpower demands which may be generated by proposed priority shifts. If industrial and occupational manpower requirements are relatively unaffected by marked changes in national priorities, then the Urban Coalition's budget recommendations may have only minimal impact. In such a case, the levels and structure of labor skills available now and in the near future will not be a major constraint on reordering priorities. If, on the other hand, the demands for certain categories of manpower resources are sensitive to shifts in expenditures, both the direct and indirect effects on the labor market structure become very important issues in priority reorientation.

This chapter first presents a brief review of recent evidence which indicates that employment demands may be very sensitive to shifting national goals and expenditure programs. It is this and related evidence which provide much of the rationale for an expanded analysis of the Urban Coalition's Counterbudget. Secondly, several alternate methodologies which were available for investigating the comprehensive and detailed manpower impacts of the Urban Coalition's priority changes are examined. Finally, the methodology relied upon in this report is reviewed and the approach itself is justified in view of the task at hand.

## A. Manpower Impacts of Changing National Priorities: A Brief Survey

In the past decade a number of independent studies have indicated marked differences in direct and indirect employment effects as a result of shifts in national priorities and expenditure programs. In two articles published in the early 1960's Wassily Leontief used large scale economic input-output models to study detailed economic and employment effects resulting (in the United States) from an arms cut and the consequent reallocation of expenditures in favor of nonmilitary programs.<sup>1</sup> In "The Economic Effects of Disarmament" Leontief and Marvin Hoffenberg investigated the likely impact of a 20% reduction in arms expenditures reallocated proportionately to competing civilian expenditure categories.<sup>2</sup> Significantly, the authors reported that compensating reductions in arms expenditures could have a very large employment impact depending upon which expenditure programs were to benefit from the defense cutbacks. Further, the authors demonstrated that while the overall employment effects would be distributed throughout the economy, individual economic sectors could be affected very unevenly. In a later article entitled "The Economic Impact--Industrial and Regional--of an Arms Cut" Leontief extended this analysis by disaggregating the national effects of disarmament into detailed industrial and regional estimates.<sup>3</sup> Here Leontief developed his national and regional analyses in more rigorous detail and attempted to determine the compensating increases in nonmilitary expenditures required to maintain a given level of employment in the face of specified reductions in military expenditures. Leontief emphasized that regional employment impacts of arms cuts may often be more significant than national industrial or occupational manpower effects.

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<sup>1</sup>See Leontief and Hoffenberg [31] and Leontief, et. al. [32].

<sup>2</sup>Leontief and Hoffenberg [31].

<sup>3</sup>Leontief, et. al. [32].

In recent years the National Planning Association has sponsored a number of studies dealing with the economic and manpower effects generated by national goals and priorities. In The Dollar Cost of Our National Goals,<sup>4</sup> Leonard Lecht "priced out" the resource costs of achieving a broad set of national goals and in Goals, Priorities, and Dollars<sup>5</sup> he indicated more precisely what it would cost the United States to attain each of its separate goals. In Manpower Needs for National Goals in the 1970's<sup>6</sup> Lecht extended his previous work by investigating the manpower implications of an effort to achieve national objectives within the next decade. He concluded that an attempt to reach all national goals by 1975 would imply a severe labor shortage of nearly ten million workers distributed unevenly among occupations and industries. Therefore, Lecht concluded that some hard choices would have to be made concerning the priorities and goals to be emphasized. In Manpower Implications of Alternate Priorities for Coping with Poverty Norman Frumkin of the National Planning Association carried Lecht's work one step further by focusing on the manpower implications associated with implementing one goal--the elimination of poverty.<sup>7</sup> Frumkin examined several poverty programs, within a comprehensive economic framework taking account of expenditure levels in other goal areas. Frumkin stressed the fact that the economic and manpower effects resulting from the pursuit of any single set of economic programs will be influenced further by expenditures in other priority areas. Thus, any investigation of the effects of implementing a particular program must be conducted within a broad framework embracing the effects of all other programs.

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<sup>4</sup>Lecht [24].

<sup>5</sup>Lecht [25].

<sup>6</sup>Lecht [26].

<sup>7</sup>Frumkin [17].



The Bureau of Labor Statistics has conducted important research in this area in cooperation with the Interagency Economic Growth Project.<sup>8</sup> In Projections 1970: Interindustry Relationships, Potential Demand, Employment, the Bureau of Labor Statistics attempted to make consistent conditional projections from 1965 to 1970 of the detailed economic and manpower effects which would result from several national expenditure compositions in 1970.<sup>9</sup> This bulletin contained four projections for 1970 which were based on different assumptions about the structure of 1970 final demand. The projections indicated that a significant effect on the level and structure of manpower requirements can result from alternate distributions of government expenditures and total final demand. In two recently published studies the Bureau of Labor Statistics has extended this research to include projections to 1980. In Patterns of U.S. Economic Growth<sup>10</sup> the Bureau of Labor Statistics updated the analysis contained in Projections 1970 by examining the implications of economic growth in the coming decade for particular problem areas, notably manpower utilization. In The U.S. Economy in 1980<sup>11</sup> the Bureau of Labor Statistics disaggregated the overall manpower effects into demands for selected occupational manpower categories. Further, in Tomorrow's Manpower Needs the Bureau of Labor Statistics forecast likely manpower requirements in 1975 for 160 industries and 185 occupations. A methodology was also suggested for dis-

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<sup>8</sup>The Interagency Economic Growth Project was begun in the late 1960's by the U.S. Department of Labor in cooperation with other government agencies and private research organizations. It represented an effort to develop a more comprehensive and integrated framework for analyzing the implications of long-term economic growth for a number of problem areas, particularly problems of manpower utilization.

<sup>9</sup>U.S. Department of Labor, Bureau of Labor Statistics [69].

<sup>10</sup>U.S. Department of Labor, Bureau of Labor Statistics [78].

<sup>11</sup>U.S. Department of Labor, Bureau of Labor Statistics [79].

aggregating these national manpower demands into regional and state manpower requirements.<sup>12</sup>

Finally, the most recent and relevant research in this area has been conducted by Roger Bezdek. In Manpower Implications of Alternate Patterns of Demand for Goods and Services Bezdek developed a model of the United States economy in the early 1960's which was capable of generating detailed industrial and occupational manpower requirements from a wide range of national expenditure distributions reflecting alternate national goals and priorities.<sup>13</sup> This work was uniquely suited to the problem presently under consideration. To begin with, the model was completely general and capable of efficiently analyzing many types of priority-expenditure distributions. Secondly, the model was comprehensive in the sense that it accounted for total gross national product, total industrial output, and total industrial and occupational employment, while systematically generating occupational manpower requirements from interindustry employment demands.

As a preliminary test of the model, detailed manpower effects of several types of priority reorientation were simulated and analyzed. From these simulations several important conclusions were derived: 1) in general, U.S. industrial and occupational manpower demands are highly sensitive to even limited shifts in the distribution of national expenditures; 2) due to the variability of the manpower impacts and to the indeterminacy of future national objectives, reliable and accurate manpower forecasting is currently impossible;

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<sup>12</sup>Unfortunately, in this study the Bureau of Labor Statistics considered only one economic future and did not generate results on the basis of alternate assumptions; see U.S. Department of Labor, Bureau of Labor Statistics [73].

<sup>13</sup>These results are reported in Bezdek [5], [6], and [7].

and 3) the demand structures of categories of manpower resources are quite different, some generated interdependently by a wide variety of factors throughout the economy, and others tied strongly to particular programs and activities.<sup>14</sup> The original system developed for 1960 by Bezdek is the prototype of models used here to investigate manpower effects of the Urban Coalition's proposed reordering of national priorities.

Thus, ample evidence exists which indicates that the structure and level of manpower requirements in the United States are influenced by national priorities and resulting expenditure programs. It is appropriate and necessary therefore, to scrutinize the manpower impacts generated directly and indirectly by the Urban Coalition's proposal.

#### B. Available Alternate Methodologies

Determining the direct and indirect manpower requirements which result from reordering national goals and priorities, is an extremely complex task. One method of generating the large amount of required data would employ a large scale structural equation model based upon classical statistical principles. However, the difficulty of constructing a model of this type large enough to be useful within the time constraint as well as the insufficient number of observations on relevant variables, and the relative absence of supportive work in this area preclude reliance upon this general approach. Instead, a comprehensive input-output model tied to the necessary manpower subcomponents was used.

Within an interindustry framework, however, there are various ways

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<sup>14</sup>For a complete discussion of these and other findings see Chapter 11 of Bezdek [5].

to proceed. One of these, the "goals analysis approach," has been developed by the National Planning Association and used with some success to investigate problems of the type being considered here. Essentially, this approach consists of defining a number of broad goal areas, determining the costs of implementing these goals simultaneously in the near future, and then analyzing the overall economic and manpower consequences implied by pursuit of these goals.<sup>15</sup> Taking the conclusions of the Eisenhower Commission on National Goals, the National Planning Association developed a number of general goal areas in terms of specific goals and individual economic programs.<sup>16</sup> However, due to the unavoidably ambiguous nature of most goal areas, individual economic programs were often included in more than one goal area. The goals analysis approach thus results in a large amount of overlapping and double counting. Furthermore, in most instances this approach does not permit precise identification of the manpower requirements generated by distinct expenditure programs and economic activities. For these and other reasons the goals analysis approach has been rejected here; instead, expenditures for distinct programs and activities are used to generate economic and manpower effects. This approach is specified in greater detail below.

#### C. Description of the Methodology Employed

The model used here to simulate the manpower effects generated by the Counterbudget priority reorderings is basically a large-scale input-output model, transformed into labor units and augmented with supplemental industrial

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<sup>15</sup>For further discussion of the goals analysis approach see Lecht [24] and [25].

<sup>16</sup>The National Planning Association considered 16 broad national goal areas: 15 of these were derived from the report of the Eisenhower Commission and the 16th, space, was added in 1961.

and occupational information. A rigorous statement of the formal theoretical model is available elsewhere; here the model shall be described in simpler and more general terms.<sup>17</sup> This system envisions U.S. industrial and occupational manpower requirements as being determined simultaneously by the level of aggregate demand, the existing state of technology, and the functional economic uses to which available resources are devoted. For a given time period--for our purposes, a specified year--the state of technology may be considered constant. Since the Urban Coalition's priority reordering largely involve the redistribution of a given level of total output to different functional uses, the level of aggregate demand shall be assumed fixed for each year considered.<sup>18</sup> Primary consideration will be given to the Urban Coalition's suggested variations in the distribution of fixed national output among competing economic activities and the detailed manpower effects which these budget redistributions may generate.

In the manpower demand generating system used here, industrial and occupational manpower requirements are determined in the following sequence:

- 1) A political decision is made concerning the goals and objectives which are to be pursued, here the decision is assumed to be in favor of the Urban Coalition's recommended objectives.

- 2) This goal decision is translated into specific expenditure patterns, in this case the Federal budget expenditures specified in Counterbudget.

- 3) Each category of activity has unique requirements for the output of each industry in the economy; the sums of all these output requirements

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<sup>17</sup>For a rigorous development of the model utilized here see Bezdek [5] and [7].

<sup>18</sup>This assumption is not necessary to maintain the validity of the model and shall be dropped in future research conducted with the system.



comprise the direct output requirements associated with a specific set of national priorities.

4) Due to an industry's need for another industry's output as its input, the total output requirements from any single industry are considerably larger than those created directly, and total economic output is the sum of the direct and the indirect output requirements from every industry.

5) Assuming that employment requirements in every industry are proportional to output requirements, each distinct level of industrial output generates an associated level of employment within that industry.

6) Finally, each industry generates distinct occupational employment requirements via industry employment-occupation ratios. This flow of causation from national priority choices through output requirements to industrial and occupational employment demands is illustrated in Figure 1. In the model itself there are three main components: an activity-industry matrix, an interindustry-employment matrix, and an industry-occupation matrix. The first component of the system, the activity-industry matrix, translates expenditures on functional economic activities into direct output demands from every industry in the economy. The second major component of the system is the interindustry-employment matrix which shows the direct and indirect employment demands generated by the activity of particular industry in every industry in the economy, including itself.<sup>19</sup> The third major component of the empirical model is the industry-occupation matrix which translates interindustry-employment requirements into occupational manpower demands. From this matrix and the defined levels of employment in each industry are derived the

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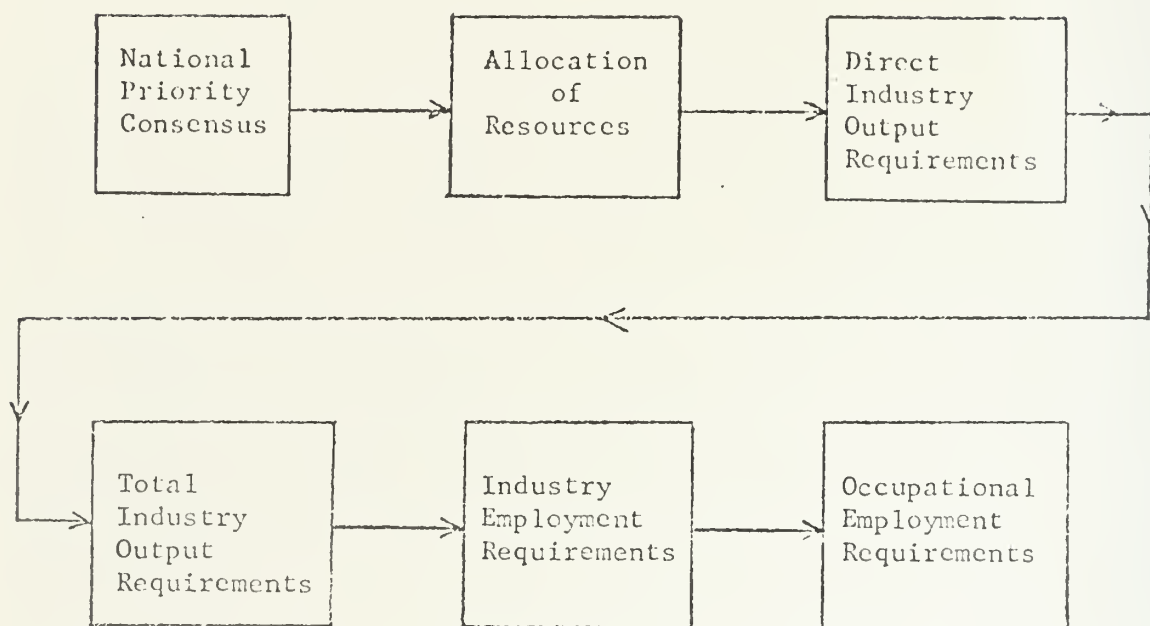
<sup>19</sup>The interindustry-employment matrix is discussed in further detail in Alterman [2], Projections 1970 [69], and in Chapters 3 and 6 of Bezdek [5].

total occupational employment requirements generated by a specified distribution of national expenditures reflecting a particular priority choice on the part of the nation.



Figure 1

Schematic Representation of the Manpower  
Demand Generating Mechanism



### CHAPTER III. DEVELOPMENT OF THE ACTIVITY AND EXPENDITURE COMPONENTS OF THE MODEL

In this chapter, construction of the interindustry manpower model used to simulate the employment effects of the Counterbudget is specified in detail. An appreciation of the operation of this model and the conventions followed in its development is necessary for a proper understanding of the conclusions reported in this study.

#### A. Specification of Forecast Target Years and Development of Activity- Expenditure Categories

In an economic sense changes in national goals and priorities refer to a redistribution of expenditures away from certain programs and activities toward those economic activities which contribute to the fulfillment of the goals and objectives being stressed. Working largely with Federal budget outlays the Urban Coalition in Counterbudget developed comprehensive alternate expenditure recommendations for the years 1972 through 1976. A summary of these recommended budget outlays is presented in Table 3-1. The problem which concerns us here is twofold: determining the manpower requirements likely to be generated in the near future by this recommended reordering of national priorities, and determining the difference between the manpower impact of the Urban Coalition's expenditure recommendations and that of expenditures "normally" expected to occur.

In principle, the manpower demands generated each year from 1972 through 1976 by the Urban Coalition expenditure distributions could be simulated and analyzed. Unfortunately, lack of extensive annual forecasts relating

Table 3-1

Summary of Budget Outlays  
(In millions of current dollars)

	<u>Administration</u>		<u>Urban Coalition Recommendations</u>				
	<u>Estimated</u>	<u>Proposed</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
<u>Human Development</u>							
Employment and Manpower Training	2,806	2,968	4,394	6,293	7,305	7,936	8,381
Economic Conversion	178	216	1,944	1,906	292	161	127
Social Insurance	47,665	50,932	56,527	61,088	66,499	71,754	83,268
Income Support	11,300	13,587	19,961	20,357	31,338	39,302	39,962
Health	17,257	19,140	19,745	24,335	61,180	63,990	68,850
Education	9,351	10,075	10,846	12,334	16,776	19,099	20,494
Subtotal	88,557	96,918	113,289	126,313	183,390	202,242	221,082
<u>Social and Physical Development</u>							
Fiscal Relief for States and Localities <sup>a</sup>	--	3,750	5,100	6,995	7,875	8,835	9,600
Metropolitan Development	2,520	3,078	4,216	6,456	7,781	8,726	8,858
Housing	1,678	1,973	2,139	2,473	2,719	3,261	3,753
Transportation	7,763	8,279	7,707	7,645	7,707	8,263	8,735
Environment and Natural Resources	3,374	4,116	3,882	4,352	4,581	4,921	5,183
Family Planning and Population Growth	87	140	287	506	341	270	249
Rural Development and Agriculture	5,871	6,136	5,453	5,816	5,943	5,968	5,945
Research and Development <sup>b</sup>	5,956	5,894	5,955	6,265	6,590	6,980	7,265
Subtotal	27,249	33,366	34,739	40,508	43,537	47,224	49,588
<u>Society Under Law</u>							
Law Enforcement and Criminal Justice	932	1,285	1,799	2,396	2,942	3,338	3,811
Equal Opportunity	111	130	185	228	257	261	263
Consumer Protection	110	128	138	158	180	198	211
Subtotal	1,153	1,543	2,122	2,658	3,379	3,797	4,285

Table 3-1 (cont'd)

	Administration Estimated Proposed		Urban Coalition Recommendations				
	<u>1971</u>	<u>1972</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
International Affairs							
National Defense and Military Assistance	74,500	76,000	60,240	50,335	48,550	50,025	50,425
Foreign Economic Assistance	2,993	3,240	3,500	4,760	5,410	6,245	7,445
Subtotal	<u>77,493</u>	<u>79,240</u>	<u>63,740</u>	<u>55,095</u>	<u>53,960</u>	<u>56,270</u>	<u>57,870</u>
Other							
Interest	19,433	19,687	19,687	22,220	23,900	25,680	28,670
Maintenance of the Mortgage Market	-977	-230	-230	-170	-130	-100	50
Postal Service c	2,353	1,333	327	300	330	360	400
Other Government Activities d	<u>6,491</u>	<u>7,092</u>	<u>6,771</u>	<u>7,049</u>	<u>7,329</u>	<u>7,620</u>	<u>7,952</u>
Subtotal	<u>27,300</u>	<u>27,882</u>	<u>26,555</u>	<u>29,399</u>	<u>31,429</u>	<u>33,560</u>	<u>37,072</u>
Less: Duplications	-1,800	-1,946	-1,978	-2,178	-3,711	-3,987	-4,249
Employer Share, Employee Retirement	-2,486	-2,461	-2,461	-2,660	-2,880	-3,120	-3,375
Interest Received by Trust Funds	<u>-4,711</u>	<u>-5,310</u>	<u>-5,310</u>	<u>-6,707</u>	<u>-7,557</u>	<u>-8,159</u>	<u>-8,788</u>
TOTAL	<u>212,755</u>	<u>229,232</u>	<u>230,824</u>	<u>242,428</u>	<u>301,377</u>	<u>327,827</u>	<u>353,485</u>

a The fiscal relief heading includes a proposed new program of general aid to elementary and secondary education, with funding beginning at \$1.0 billion in 1972 and building to \$4.0 billion by 1976. These funds would entirely serve educational purposes even though a major motive for proposing the program is the need for fiscal relief to states and localities. For further discussion, see Chapters 6 and 7 of Counterbudget [4].

b Includes NASA, AEC, and basic research activities supported by the National Science Foundation. Other R and D activities are included in the various functional area budgets.

c The decline in recommended Federal outlays for support of the United States Postal Service reflects an assumed implementation of the President's Commission on Postal Organization recommendation that postal subsidies (free and reduced rate mail and other public service costs) be limited to three per cent of total postal revenue requirements.

d Other government activities for 1971 determined as the residual factor after all specifically analyzed programs were accounted for. Source: Counterbudget [4].

to the variables in question prevented the generation of manpower demands for all five years in question. It was decided instead to analyze the overall and the differential manpower impact of the Urban Coalition's programs for 1972 and for 1976. 1972 is the first year for which the Urban Coalition has developed alternate budget recommendations. These can be compared directly with the administration's projected budget outlays for the same year. Over the period of the subsequent four years, the Urban Coalition's federal budgets increasingly reflect the Counterbudget priority reorderings, culminating in 1976. It is to be expected, then, that the differential manpower effects would be relatively slight the first year but would grow increasingly important as the years went by. Analyzing probable manpower impacts for 1972 yields insight into the differing general manpower profiles of the two sets of priorities. By analyzing the manpower implications of the Urban Coalition's budget reallocations in 1976 a measure of the total changeover effect is gained.

In the empirical model, changes in national priorities enter as redistributions of expenditures among the elements of the activity-expenditure vector. This redistribution generates direct industrial output requirements through the columns of the activity-industry matrix. The first problem encountered is insuring that expenditure categories among which budget outlays are reallocated by the Urban Coalition relate consistently to activity category columns in the activity-industry matrix. One of the most serious problems encountered in the development of the empirical model, this warrants closer examination.

As indicated in the previous chapter, the activity-industry matrix transforms expenditures for specific economic programs and activities into direct output requirements for every industry in the economy. Each column of



this matrix is a "bill of goods" or "input" vector showing in percentage terms the manner in which expenditures for a certain program or activity are distributed as purchases of goods and services for every industry in the economy. Ideally, a separate input vector would exist for each budget category considered by the Urban Coalition for 1972 and 1976. Unfortunately, data relating to the industrial distribution of budget and final demand expenditures in detail are extremely difficult to obtain for any time period, and are especially difficult to obtain for future time periods. The development of the activity input vectors was extremely difficult and required a great deal of time and effort. Essentially, as many detailed and specialized activity vectors relating to the time periods in question are developed and used to reconcile the Urban Coalition's budget categories. In all, thirty-one input vectors relating to expenditure categories within the Federal budget were developed for use in this report. The activity categories which generate direct industrial output requirements in the model employed here and the relationship of these categories to those of the Urban Coalition's budget categories are presented below in Table 3-2.

As indicated, the approach followed here is comprehensive, accounting for total gross national product and total industrial output. While Federal expenditures are a large and strategic component of total national expenditures they do compose only a fraction of the total.<sup>1</sup> It is a basic contention of this study that the overall manpower impacts of the type of budget reallocations suggested in Counterbudget can be validly analyzed only by incorporating them within a comprehensive economic model which also considers all the other

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<sup>1</sup>For selected categories of manpower resources, however, Federal expenditures may have a very disproportionate demand generating effect. For a recent investigation of this see Aronson [3].

Table 3-2

Relationship Between Activity Categories  
and Urban Coalition Budget Categories

Activity Category Titles	Corresponding Urban Coalition Federal Programs
Federal Government Expenditures, Total	Refers primarily to direct and indirect purchases of goods and services induced by Federal government Expenditures. Detailed specifications are given for the appropriate activity categories.
National Defense	Corresponds to all of the Urban Coalition's national defense categories except foreign military support and assistance programs.
Intelligence and Communications	Intelligence and Communications
Airlift and Sealift	Airlift and Sealift
Research and Development	Military Research and Development
Operations, Maintenance, and Administration	Central Supply and Maintenance Training, Medical, and Other Personal Activities Administration and Associated Activities
Other National Defense	Strategic Forces General Purpose Forces Guard and Reserve Forces
Health	Corresponds to all of the Urban Coalition's Health categories except Manpower Training and Education and Biomedical Research
Health Facilities	Construction of Health Facilities and a portion of Community Health Centers and Other Resource Distribution Programs
National Health Insurance	National Health Insurance, Medicare and Medicaid, and a portion of community health care services
Other Health	Disease Prevention and Control, Other Health, and a portion of care for Veterans, Indians, and Other Special Groups



Table 3-2 (cont'd)

Transportation	Corresponds to most of the Urban Coalition's Transportation categories
Highways	Highways
Railroad and Mass Transit	Includes the following two categories:
New Facilities	Construction of new rail and mass transit systems
Improvement of Existing Facilities	Improvement, extension, and maintenance of existing rail and transit facilities
Supersonic Transport and Civil Aviation	Supersonic Transport, Civil Aviation
Merchant Marine	Merchant Marine
Inland Navigation	Inland Navigation (Army Corps of Engineers)
Social Welfare	Social Insurance, Income Support
Law Enforcement, Criminal Justice, and Civilian Safety	Law Enforcement and Criminal Justice
Education, Arts, and Humanities	Includes the following two categories:
Educational and Cultural Facilities	Construction of educational and cultural facilities
Other Educational, Arts, and Humanities	All other educational, arts, and humanities
Environment, Natural Resources, and Sanitation	Includes Environment and Natural Resources and a portion of Metropolitan Development
Water and Sewer Facilities	Water and Sewer Facilities, Grants (Metropolitan Development)
Flood Control and Irrigation	Public Works: Flood Control and Irrigation
Waste Treatment Facilities	Waste Treatment Facilities, Solid Waste
Other Environment, Natural Resources, and Sanitation	Noise, Land Use and Recreation, Oceans

Table 3-2 (cont'd)

Metropolitan Development and Housing	Includes Housing and most of Metropolitan Development
Urban Renewal and Housing	Model Cities, Urban Renewal, Urban Recreation, Supplementary Public Facility Grants
Housing Subsidies	Federal Housing Subsidies
Foreign Economic and Military Assistance	Military Support of Other Nations, Military Assistance Program, Foreign Bilateral and Multilateral Economic Assistance
Research and Development	Includes all research and development listed under specific programs except Military Research and Development, Atomic Energy Commission, and National Aeronautics and Space Administration
National Aeronautics and Space Administration	National Aeronautics and Space Administration
Atomic Energy Commission	Atomic Energy Commission
Fiscal Relief to State and Local Governments	Fiscal Relief to States and Localities
Educational Grants	General Aid to Education
Revenue Sharing and Interest Subsidies	Revenue Sharing, Interest Subsidy for State and Local Securities
Other Federal	Includes all programs and portions of programs not included elsewhere

components of gross national product: personal consumption expenditures, investment, exports and imports, and state and local government expenditures. Therefore, it was necessary to develop input vectors for each of these additional economic activities and incorporate them into the activity-industry matrix along with the vectors for Federal budget expenditures. Problems similar to those encountered in the development of the Federal budget input vectors were also encountered in the derivation of these bills of goods vectors relating to the other components of gross national product. Eventually, though, 26 bills of goods vectors relating to these other expenditure categories were developed and a complete set of 58 activity categories was comprised. These are listed in Table 3-3.

Each of the public and private expenditure categories listed in Table 3-3 corresponds to a column vector in the activity-industry matrix and indicates how expenditures devoted to that activity are distributed as purchases of goods and services from every industry in the year in question. The industry classification scheme used here corresponds very closely to the 80-order industry classification used by the U.S. Office of Business Economics in their recent interindustry studies.<sup>2</sup> The industry numbering, industry titles, and corresponding Standard Industrial Classification codes used by the Office of Business Economics are presented in Table 3-4. The minor modifications made in this classification scheme relate here to special handling of several industries and expenditure categories and other necessary adjustments. In all, 89 separate industries are included in the activity-industry matrix used in this study.

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<sup>2</sup>The 1958 Office of Business Economics interindustry study is discussed in Goldman, Marimont and Vaccara [20]; the 1963 Office of Business Economics interindustry study is discussed in U.S. Department of Commerce, Office of Business Economics [65].

Table 3-3

Economic Activity Categories  
Considered for Analysis

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I. Personal Consumption Expenditures, Total

1. Food and tobacco
2. Clothing, accessories, and jewelry
3. Personal care
4. Housing
5. Household operation
6. Medical care and death expenses
7. Personal business
8. Transportation
9. Recreation
10. Private education and research
11. Religious and welfare activities
12. Foreign travel and remittances, net

II. Gross Private Domestic Investment, Total

13. Plant and equipment construction
14. Residential
15. Private Nonresidential
16. Net Inventory Change

III.

17. Exports
18. Imports

IV. Federal Government Expenditures, Total

National Defense

19. Intelligence and communications
20. Airlift and sealoift
21. Research and development
22. Operation, maintenance and administration
23. Other national defense

Health

24. Health facilities
25. National Health Insurance
26. Other Health

Transportation

27. Highways
- Railroad and mass transit
28. New facilities
29. Improvement of existing facilities
30. Supersonic transport and civil aviation
31. Merchant marine
32. Inland navigation

Table 3-3 (cont'd)

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33.	Social welfare
34.	Law enforcement, criminal justice and civilian safety
Education, Arts, and Humanities	
35.	Education and cultural facilities
36.	Other educational, arts and humanities
Environment, Natural Resources, and Sanitation	
37.	Water and sewer facilities
38.	Flood control and irrigation
39.	Waste treatment facilities
40.	Other environment, natural resources, and sanitation
Metropolitan Development and Housing	
41.	Urban renewal and housing
42.	Housing subsidies
43.	Foreign economic and military assistance
44.	Research and development
45.	National Aeronautics and Space Administration
46.	Atomic Energy Commission
Fiscal Relief to State and Local Governments	
47.	Educational grants
48.	Revenue sharing and interest subsidies
49.	Other Federal
V. State and Local Government Expenditures, Total	
50.	Education
51.	Health, welfare, and sanitation
52.	Civilian safety
53.	Highways
54.	Transit
Public Utilities	
55.	Electric utilities
56.	Water and gas utilities
57.	Conservation and Development
58.	Other State and Local

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Table 3-4

Industry Numbering for Recent Input-Output Studies  
by the U.S. Office of Business Economics

Industry Number and Industry Title	Related SIC Codes (1957 Edition)
Agricultural, forestry, and fisheries:	
1. Livestock and livestock products	013, part 014, 0193, part 02, part 0729
2. Other agricultural products	011, 012, part 014, 0192, 0199, part 02
3. Forestry and fishery products	074, 081, 082, 084, 086, 091
4. Agricultural, forestry, and fisheries services	071, 0723, part 0729, 085, 098
Mining:	
5. Iron and ferroalloy ores mining	1011, 106
6. Nonferrous metal ores mining	102, 103, 104, 105, 108, 109
7. Coal mining	11, 12
8. Crude petroleum and natural gas	1311, 1321
9. Stone and clay mining and quarrying	141, 142, 144, 145, 148, 149
10. Chemical and fertilizer mineral mining	147
Construction:	
11. New construction	138, part 15, part 16, part 17, part 6561
12. Maintenance and repair construction	part 15, part 16, part 17
Manufacturing:	
13. Ordnance and accessories	19
14. Food and kindred products	20
15. Tobacco manufactures	21
16. Broad and narrow fabrics, yarn and thread mills	221, 222, 223, 224, 226, 228
17. Miscellaneous textile goods and floor coverings	227, 229
18. Apparel	225, 23 (except 239), 3992
19. Miscellaneous fabricated textile products	239
20. Lumber and wood products, except containers	24 (except 244)
21. Wooden containers	244
22. Household furniture	251
23. Other furniture and fixtures	25 (except 251)
24. Paper and allied products, except containers and boxes	26 (except 265)
25. Paperboard containers and boxes	265
26. Printing and publishing	27



Table 3-4 (cont'd)

Industry Number and Industry Title		Related SIC Codes (1957 Edition)
27.	Chemicals and selected chemical products	281 (except alumina part of 2819) 289 282 283, 284 285 29 30 311, 312 31 (except 311, 312) 321, 322, 323 324, 325, 326, 327, 328, 329 331, 332, 3391, 3399 2819 (alumina only), 333, 334, 335, 336, 3392 3411, 3491 343, 344 345, 346
28.	Plastics and synthetic materials	
29.	Drugs, cleaning, and toilet preparations	
30.	Paints and allied products	
31.	Petroleum refining and related industries	
32.	Rubber and miscellaneous plastics products	
33.	Leather tanning and industrial leather products	
34.	Footwear and other leather products	
35.	Glass and glass products	
36.	Stone and clay products	
37.	Primary iron and steel manufacturing	
38.	Primary nonferrous metals manufacturing	
39.	Metal containers	
40.	Heating, plumbing, and fabricated structural metal products	
41.	Screw machine products, bolts, nuts, etc., and metal stampings	
42.	Other fabricated metal products	342, 347, 348, 349 (except 3491)
43.	Engines and turbines	351
44.	Farm machinery and equipment	352
45.	Construction, mining, oil field machinery and equipment	3531, 3532, 3533
46.	Materials handling machinery and equipment	3534, 3535, 3536, 3537
47.	Metalworking machinery and equipment	354
48.	Special industry machinery and equipment	355
49.	General industrial machinery and equipment	356
50.	Machine-shop products	359
51.	Office, computing and accounting machines	357
52.	Service industry machine	358
53.	Electric transmission and distribution equipment, and electrical industrial apparatus	361, 362
54.	Household appliances	363
55.	Electric lighting and wiring equipment	364
56.	Radio, television, and communication equipment	365, 366

Table 3-4 (cont'd)

Industry Number and Industry Title	Related SIC Codes (1957 Edition)
57. Electronic components and accessories	367
58. Miscellaneous electrical machinery, equipment, and supplies	369
59. Motor vehicles and equipment	371
60. Aircraft and parts	372
61. Other transportation equipment	373, 374, 375, 379,
62. Professional, scientific, and controlling instruments and supplies	381, 382, 384, 387
63. Optical, ophthalmic, and photographic equipment and supplies	383, 385, 386
64. Miscellaneous manufacturing	39 (except 3992)
Transportation, communication, electric, gas, sanitary services:	
65. Transportation and warehousing	40, 41, 42, 44, 45, 46, 47
66. Communications, except radio and television broadcasting	481, 482, 489
67. Radio and television broadcasting	483
68. Electric, gas, water, and sanitary services	49
Wholesale and retail trade:	
69. Wholesale and retail trade	50 (except manufacturers sales offices), 52, 53, 54, 55, 56, 57, 58, 59, part 7399
Finance, insurance, and real estate:	
70. Finance and insurance	60, 61, 62, 63, 64, 66, 67
71. Real estate and rental	65 (except 6541 and part 6561)
Services:	
72. Hotels and lodging places; personal and repair services, except automobile repair	70, 72, 76 (except 7694 and 7699)
73. Business services	6541, 73 (except 7361, 7391 and part 7399) 7694, 7699, 81, 89 (except 8921)
74. Research and development	--
75. Automobile repair and services	75
76. Amusements	78, 79
77. Medical, educational services, and nonprofit organizations	0722, 7361, 80, 82, 84, 86, 8921



Table 3-4 (cont'd)

Industry Number and Industry Title	Related SIC Codes (1957 Edition)
Government enterprises:	--
78. Federal government enterprises	--
79. State and local government enterprises	--
Imports:	--
80. Gross imports of goods and services	--
Dummy industries:	--
81. Business travel, entertainment, and gifts	--
82. Office supplies	--
83. Scrap, used and secondhand goods	--
Special industries:	--
84. Government industry	--
85. Rest of world industry	--
86. Household industry	--

Source: U.S. Department of Commerce, Office of Business Economics.

For the purposes of this report, two 89-by-58 activity-industry matrices have been constructed--one for 1972 and the other pertaining to 1976--and each of these transforms public and private expenditures for 58 different types of output into direct demands for the outputs of 89 industries. The 58 expenditure categories account for total gross national product and the 89 industries account for total net national industrial output. In addition, there is no double counting or overlapping contained in either the activity categories or the industry categories.<sup>3</sup>

Since each input column vector had to be derived independently, the activity vectors are of differing and indeterminate degrees of accuracy. Some distortion of expenditure patterns and output requirement undoubtedly results. Nevertheless, it is believed that the activity-industry matrices utilized here do contain generally reliable information on the industrial composition of different types of public and private economic activities and that they yield results sufficiently accurate for analyzing the Urban Coalition's proposals.

#### B. Development and Deflation of Consistent Expenditure Totals

A major step in our approach is the assigning of specific levels of expenditures to each specific program and activity. This is not by any means as simple or straightforward a task as it may seem initially. Expenditures for many types of programs (for instance, interest payments, veterans benefits, and social security payments) are often determined by outside or historical factors and cannot be readily reduced by the government. Expenditures for some types of programs are interdependent for economic, political, or administrative reasons and cannot easily be changed individually. Special attention must be paid to recent economic and political trends so that any expenditure

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<sup>3</sup>The concept of the activity-industry matrix was introduced in Bezdek [6]. Further research into this concept is in progress.

redistribution or program reorientations hypothesized are not totally unbelievable and infeasible.<sup>4</sup>

In Counterbudget the Urban Coalition has produced a comprehensive and exhaustive study of the possibilities and potential for reordering national priorities. The problems mentioned above were considered realistically by the Urban Coalition in formulating their budget recommendations. Different aspects of their suggested priority reorderings were analyzed in Counterbudget: the sources and uses of the budget outlays were carefully indicated, and the tax proposals necessary to obtain additional revenues were identified. Finally, the Urban Coalition recognized the balance between objective social realities and their subjective value judgments throughout the volume.

Since the sole purpose of our research was to analyze the potential manpower impacts which affect the possibility of Counterbudget, the suggested budget outlays were accepted here without comment or modification. The major tasks of examining and reallocating activity expenditures for the years in question were not necessary for our study, but the Urban Coalition recommendations had to be translated into a format suitable for use in the empirical model.

The first step in the development of the desired expenditure estimates was the reconciliation of the expenditures in the Urban Coalition's budget categories with the activity categories contained in the activity-industry matrix. These expenditure totals for 1972 and 1976 are presented in Table 3-5.

In this table, the two to four billion dollars of duplications shown in Table 3-1 have been sorted out and, in some cases, expenditures have been transferred from certain functional categories to others where it was deemed

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<sup>4</sup>An interesting study of the economic and political factors present in the determination of national priorities is presented by Charles Schultze in [48].

Table 3-5  
Federal Government Activity  
Expenditures: 1972 and 1976  
(in millions of current dollars)

Activity Category Title and Number	1972		1976
	Administration Proposed	Urban Coalition Recommended	Urban Coalition Recommended
IV. Federal Government Expenditures, Total	229,232	230,824	353,485
National Defense	72,575	57,030	47,830
19. Intelligence and Communications	5,600	5,185	5,265
20. Airlift and Sealift	1,100	1,480	1,445
21. Research and Development	5,500	4,585	5,440
22. Operations, Maintenance and Administration	25,300	17,525	13,020
23. Other National Defense	35,075	28,255	22,660
Health	16,766	17,330	65,863
24. Health Facilities	559	497	523
25. National Health Insurance	15,095	15,680	64,600
26. Other Health	1,112	1,153	740
Transportation	7,652	7,334	8,259
27. Highways	4,923	4,100	3,070
Railroad and Mass Transit	--	673	1,885
28. New Facilities	--	333	1,610
29. Improvement of Existing Facilities	--	240	275
30. Supersonic Transport and Civil Aviation	1,834	1,860	3,010
31. Merchant Marine	467	315	125
32. Inland Navigation	428	386	169
33. Social Welfare	64,519	76,488	123,230
34. Law Enforcement, Criminal Justice, and Civilian Safety	1,285	1,799	3,811

Table 3-5 (cont'd)

Activity Category Title and Number	1972		1976
	Administration Proposed	Urban Coalition Recommended	Urban Coalition Recommended
Education, Arts and Humanities	10,273	11,082	21,105
35. Educational and Cultural Facili- ties	1,521	1,641	3,126
36. Other Education, Arts, and Humani- ties	8,752	9,441	17,979
Environment, Natural Resources, and Sanita- tion	4,042	4,161	6,393
37. Water and Sewer Facilities	284	500	1,615
38. Flood Control and Irrigation	460	460	363
39. Waste Treatment Facilities	1,000	612	1,304
40. Other Environment, Natural Resources, and Sanitation	2,218	2,589	3,111
Metropolitan Development and Housing	3,700	5,494	8,036
41. Urban Renewal and Housing	1,752	3,420	4,383
42. Housing Subsidies	1,948	2,074	3,653
43. Foreign Economic and Military Assistance	6,665	6,710	10,040
44. Research and Devel- opment	4,973	5,220	7,801
45. National Aero- nautics and Space Administration	3,151	3,100	3,800
46. Atomic Energy Commission	630	555	705
Fiscal Relief to State and Local Governments	3,750	5,100	9,425
47. Educational Grants	--	1,000	4,000
48. Revenue Sharing and Interest Subsidies	3,750	4,100	5,425
49. Other Federal	29,251	29,516	37,187

Source: Counterbudget [4].

they more properly belong. For example, Research and Development activities listed separately under each program were grouped together and considered separately, expenditures for water and sewer facilities were removed from metropolitan development programs and included as a separate activity, and the manpower training and education expenditures listed under the health objective were transferred to the education function.

Ordinarily only a small portion of the expenditures listed in the Federal "administrative budget" are included in the Federal government category in the national income accounts. In the interindustry tables only the government's direct purchases of goods and services enter the accounting system as expenditures; the largest portion of the expenditures consists of transfer payments, special types of compensation, etc. which are recorded for input-output purposes as expenditures or purchases made by the economic sector actually receiving the transfer or subsidy. Although this conventional definition of expenditures might have been used here, it was considered more advisable to combine the administrative and interindustry definitions of expenditures and to include most Federal expenditures--purchases, subsidies, compensation, and transfers--in the relevant budget categories. The aim of the Urban Coalition was to determine the total manpower impact of their recommendations, including the effects of other types of government expenditures as well as direct purchases.<sup>5</sup>

While this method yields a more complete picture of the direct and indirect economic and manpower impacts of Federal activities, it also makes the

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<sup>5</sup>A discussion of some ways in which the handling of input-output and related data could be improved in the national economic accounts is contained in Ruggles and Ruggles [43].



proper interpretation of the Urban Coalition's budget reorderings and recommendations considerably more difficult. For example, Table 3-5 shows that between 1972 and 1976 the Urban Coalition has recommended more than a tripling of Federal expenditures in health care programs with most of the increase used to institute a comprehensive system of national health insurance. However, the amounts involved represent only a modest increase in levels of total spending on health care, for the Urban Coalition's recommended National Health Insurance program would largely supplant existing private health care and health insurance programs.<sup>6</sup> The change in the amounts involved appears deceptively large because in 1974, according to the Urban Coalition scenario, the Federal government would institute National Health Insurance which would supplant most private health plans. In an economic sense it makes little difference whether these transactions are recorded as expenditures allocated to the private sector or as expenditures allocated to the Federal government for, distributional questions aside, they satisfy the same economic and social needs. Similarly, the activity category "Social Welfare Payments" consists largely of transfers from the government to private sectors, and its distribution depends largely on the consumption expenditure patterns of selected low income and aged consumers.<sup>7</sup> In traditional national income and interindustry accounts these transactions are recorded as purchases by the private sector; here they are recorded as purchases induced by a specific type of government program.

After the preliminary gross expenditure estimates recommended by the Urban Coalition were grouped into the desired activity-expenditure categories, the totals in each category were adjusted to take account of a number of fac-

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<sup>6</sup>See Chapter 5 of Counterbudget [4].

<sup>7</sup>The methodology involved in developing an input vector for social welfare payments is discussed in depth in Bezdek [5].



tors: duplicate coverage contained in the original Urban Coalition suggested budget outlays was removed, additional selected types of transfers, compensation, interest subsidies, etc. were transferred from Federal budget categories to appropriate public and private economic activity categories, and, most important, expenditures in each category were deflated to constant base year prices.

As indicated in Table 3-1 the original Urban Coalition budget recommendations contained about 1% duplicate coverage, which had to be removed. In addition, numerous transfers and subsidies in the original budget were transferred to appropriate public and private economic sectors. While in most instances they comprised only a small fraction of the individual expenditure category totals, in the aggregate they represented a sum too large to ignore.

When duplications had been eliminated and various expenditures transferred to more appropriate categories, estimates of recommended net expenditures were obtained for each Federal budget category. However, these estimates were stated in terms of current (1972 or 1976) dollars. The estimates had to be deflated to constant base year (1958) dollars to be used in the empirical model employed. It was thus necessary to deflate the net expenditure estimates for all 58 activity categories from 1972 prices and 1976 prices to 1958 prices.

The process of deflating expenditures in each public and private economic activity category to 1958 prices was an involved and complex task. In general, attempts to deflate expenditures stated in dollars of one time period to price levels of another time period nearly two decades earlier presented a number of difficult problems: changes in the quality of products, changes in the product mix, introduction of new products and the elimination of other

products. Problems arose because the programs and activities involved utilized different types of products and services, placed disproportionate demand upon the output of certain industries, and often had a direct influence on the costs of those services. The prices of public and private economic activities considered here rose at widely differing rates in the past and may be expected to continue to do so in the future. For this reason it would have been grossly inaccurate to apply a single general price deflator to every expenditure category; a separate deflator had to be derived for each specific category for 1972 and 1976.

The difficulty of developing individual price deflators varied greatly depending upon the specific category being considered. For some categories, such as personal consumption, price indexes for the past several decades had been consistently developed and projected for the coming decade. Similar indexes existed for some other types of public and private expenditure categories, and deflating expenditures for these was also relatively easy. But even in the cases where published figures were available, much of these data--especially for the projected series--was often contradictory. Some of this was due to the unexpectedly rapid rate of inflation in the period 1968-1971; in other cases the reasons for the disagreement were not immediately clear.

For a considerable number of activities, the exact type of desired information did not exist and a variety of ad hoc methods had to be devised to develop approximate price deflators. For example, since the expenditures included in the Federal social welfare category were composed very largely of purchases by low income and aged consumers, the deflators for this category were computed by taking weighted averages of the deflators for appropriate Personal Consumption Expenditures (PCE) categories and for government social

service categories. Similarly, for government programs functionally similar to private economic activity, deflators were derived for each economic activity category for 1972 and 1976. Expenditures in current dollars were translated into (real) deflated expenditures stated in terms of 1958 dollars.<sup>8</sup>

The expenditures on each of the 58 activity categories proposed by the administration for 1972, recommended by the Urban Coalition for 1972, and recommended by the Urban Coalition for 1976 stated in terms of 1958 dollars, are given in Table 3-6.

#### C. The Complete Activity-Industry Matrix and the Alternate Expenditure Vectors

The deflation of expenditure estimates for the 1970's to 1958 price levels marked the completion of the development of the first component of the manpower demand generating model. This component consisted of two matrices and three vectors. The two matrices involved were activity-industry matrices whose column vector coefficients indicated the direct output demands generated by expenditures on 58 types of economic activities in 1972 and in 1976. The vectors indicated, in constant base year prices, the distribution of total national expenditures among the 57 activity categories proposed by the administration in 1972 and recommended by the Urban Coalition in 1972 and in 1976. This part of the chain is complete: the Urban Coalition's priority reorderings have determined the specified distribution of national expenditures among the 58 categories and the activity-industry matrices have transformed these priority-expenditure distributions, for the appropriate year, into direct requirements for goods and services from 89 all-inclusive industries.

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<sup>8</sup>The specific price deflators used here were included as an appendix in Bezdek and Scoville [8].

Table 3-6  
Deflated Net Activity Expenditures  
(In millions of 1958 dollars)

Activity Category Title and Number	1972		1976
	Administration Proposed	Urban Coalition Recommended	Urban Coalition Recommended
I. Personal Consumption Expenditures, Total	457,199	454,376	536,490
1. Food and tobacco	103,351	102,929	145,761
2. Clothing, accessories, and jewelry	48,160	48,006	56,230
3. Personal care	8,099	7,808	7,938
4. Housing	75,406	74,717	74,592
5. Household operation	72,094	71,755	83,559
6. Medical care and death expenses	21,283	20,922	23,241
7. Personal business	24,001	23,932	18,742
8. Transportation	67,069	66,334	76,647
9. Recreation	20,664	20,635	35,451
10. Private education and research	6,402	6,747	4,319
11. Religious and Welfare research	7,083	7,014	5,886
12. Foreign travel and remittances, net	3,587	3,577	4,124
II. Gross Private Domestic Investment, Total	121,592	122,055	143,438
13. Plant and Equipment Construction	62,804	62,406	74,300
14. Residential	53,242	53,743	62,881
15. Private Nonresidential	25,794	26,069	31,075
16. Net Inventory Change	27,448	27,647	31,806
17. Exports	5,906	5,906	6,257
III.			
17. Exports	4,607	4,602	6,911
18. Imports	6,434	6,451	7,813
IV. Federal Government Expenditures, Total	122,933	126,909	179,153
National Defense	42,104	33,434	25,490
19. Intelligence and Communications	3,906	3,631	3,228
20. Airlift and Sealift	797	1,090	924
21. Research and Development	3,834	3,202	3,325

Table 3-6 (cont'd)

Activity Category Title and Number	1972		1976
	Administration Proposed	Urban Coalition Recommended	Urban Coalition Recommended
22. Operation, Maintenance and Adminis- tration	14,176	9,717	6,545
23. Other Nat'l Defense	19,391	15,794	11,468
Health 9,959		10,297	35,210
24. Health Facil- ities	347	309	287
25. Nat'l Health Insurance	9,299	9,659	34,690
26. Other Health	313	329	233
Transportation 2,802		3,193	5,007
27. Highways	2,802	2,333	1,586
Railroad and Mass Transit	--	430	1,286
28. New Facili- ties	--	250	1,102
29. Improvement of Existing Facil- ities	--	180	184
30. Supersonic Transport and Civil Aviation	1,378	1,397	1,962
31. Merchant Mar- ine	370	250	82
32. Inland Navi- gation	290	263	91
33. Social Welfare 41,937		49,717	72,706
34. Law Enforcement, Criminal Justice and Civilian Safety	706	996	1,919
Education, Arts, and Humanities 5,188		5,566	9,542
35. Education and Cultural Facilities	907	976	1,636
36. Other Educa- tional, Arts and Humanities	4,281	4,590	7,906
Environment, Natural Resources and Sanita- tion 2,692		2,757	3,330
37. Water and Sew- er Facilities	173	304	810

Table 3-6 (cont'd)

Activity Category Title and Number	1972		1976
	Administration Proposed	Urban Coalition Recommended	Urban Coalition Recommended
38. Flood Control and Irrigation	304	304	191
39. Waste Treat- ment Facili- ties	667	405	678
40. Other Envir- onment, Na- tural Re- sources, and Sanitation	1,548	1,744	1,651
Metropolitan Develop- ment and Housing	1,881	2,841	3,787
41. Urban Renewal and Model Cities	879	1,782	2,066
42. Housing subsi- dies	1,002	1,059	1,721
43. Foreign Eco- nomic and Military As- sistance	3,009	2,988	4,062
44. Research and Development	3,408	3,549	4,688
45. Nat'l Aero- nautics and Space Admin- istration	2,250	2,213	2,375
46. Atomic Energy Commission	439	388	428
Fiscal Relief to State and Local Government	1,474	2,099	3,659
47. Educational Grants	--	464	1,568
48. Revenue Shar- ing and Inter- est Subsidies	1,474	1,635	2,091
49. Other Federal	5,084	6,052	6,950
V. State and Local Govern- ment Expenditures, Total	73,096	73,148	96,690
50. Education	32,480	32,480	37,750
51. Health, Welfare and Sanitation	9,112	9,112	15,137
52. Civilian Safety	5,092	5,092	6,755
53. Highways	6,824	6,824	10,140
54. Transit	687	691	901



Table 3-6 (cont'd)

Activity Category Title and Number	1972		1976
	Administration Proposed	Urban Coalition Recommended	Urban Coalition Recommended
Public Utilities	1,805	1,812	1,967
55. Electric Utilities	770	774	959
56. Water and Gas Utilities	1,035	1,038	1,008
57. Conservation and Development	4,681	4,720	4,612
58. Other State and Local	12,415	12,417	19,428
Total National Expenditures	772,993	773,804	954,852

Source: See this chapter.



## CHAPTER IV. DEVELOPMENT OF THE MANPOWER COMPONENTS OF THE MODEL

### A. From Direct Industrial Output Demands to Interindustry-Employment Requirements

The development of the alternate deflated expenditure vectors and the activity-industry matrices made it possible to generate direct industrial output demands from different distributions of national expenditures. The next step was to develop a set of industry-employment matrices for 1972 and for 1976 which would translate the generated output requirements into direct and indirect industry employment demands.

The first step in developing an interindustry-employment matrix (or employment inverse matrix) is to construct an input-output transaction matrix for the time period in question. This matrix shows the purchases per unit of output made directly by every industry from all the industries in the economy: the rows of this matrix illustrate the distribution of an industry's output among other industries and the columns reflect the input structure of a particular industry.<sup>1</sup> From the transaction matrix what is known as the Leontief inverse matrix can be derived. This matrix shows the total (direct and indirect) output demands generated per unit of delivery to final demand by every industry.

The interindustry-employment matrix is essentially the Leontief inverse matrix transformed into labor units. This transformation is accomplished by applying employment-output ratios (indicating the total employment generated in a specific industry per unit of output) to every row of Leontief inverse.

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<sup>1</sup>See Goldman, Marimont, and Vaccara [20].

Reading down a column of this matrix indicates the manner in which the employment generated by a specific industry is distributed among all industries; reading across a row of this matrix shows how the employment in a specific industry is generated by activity within every industry. The row sums of this matrix give the total employment generated in a certain industry and the column sums of this matrix give the total employment generated by a certain industry. Thus, by using the interindustry-employment matrix it is possible to determine the total employment requirements which would be generated by a particular distribution of direct output requirements.<sup>2</sup>

Fortunately, a number of Leontief inverse matrices and interindustry-employment matrices have already been published for the United States economy, so that this estimation was not necessary. In projecting an input-output inverse matrix, a number of factors had to be taken into account which may have altered the coefficients of the matrix: changing technology and productivity, changes in product mix, product substitution, changing relative price levels, changes in product design, shifts in intermediate and intraplant transactions, and so forth. A large volume of literature has been written concerning the projection of input-output relationships and coefficients: any detailed analysis or description of these problems is outside the scope of this report.<sup>3</sup> Nevertheless, several points are in order here.

First of all, despite the many complex problems involved in projecting interindustry relationships, a number of methods of input-output forecasting have been devised which do yield reasonably accurate results. One of these is the "best practice" technique. Operations of the most efficient and pros-

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<sup>2</sup>The interindustry-employment matrix is discussed in Alterman [2] and in Chapters 3 and 6 of Bezdek [5].

<sup>3</sup>See Almon [1] and Carter [9].

perous firms are observed to obtain insight into the direction in which other firms may be moving in the near future.<sup>4</sup> Second, many interindustry relationships change very gradually: these may often be considered constant or at least predictable within a sufficiently small margin of error. Further, to the degree that the errors in the coefficient matrices are offsetting or dampening, small errors in a large number of coefficients may cancel each other out in the aggregate. Finally, the derived interindustry projections can be checked at every stage in the analysis against outside, independent forecasts to prevent errors from getting completely out of hand.

Thus, the problem was essentially one of obtaining inverse matrices which would represent the U.S. economic structure in 1972 and in 1976. Available matrices pertaining to the late 1960's were projected to 1972 and 1976. The basic data relied upon for the development of these matrices was provided by the Interagency Economic Growth Project. In projecting these matrices, trends in the coefficients over the past two decades were taken into account, the most accurate and recently available interindustry data were considered, and several industries and sectors were handled separately and projected independently.

The result was two interindustry-employment matrices, one for 1972 and one for 1976. The accuracy and reliability of these matrices are indeterminate at the present time. However, simulations and tests conducted with the derived matrices indicate that for the time periods in question they do generate comprehensible results and believable employment requirements. The matrices used here are considered to be accurate enough for evaluation of manpower im-

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<sup>4</sup>See Almon [1].

pacts when these have been reaggregated to occupation level. Nevertheless, the testing, modification, and improving of this component of the manpower model are long-range tasks and areas for continuing investigation.<sup>5</sup>

With the development of the forecast 1972 and 1976 employment inverse matrices it was possible to simulate one type of manpower impact recommended by the Urban Coalition's budget: the effects of budget reallocations upon total employment. More valuable information comes from an examination of the occupational manpower impacts which might result from the Urban Coalition's recommended priority reorderings, an examination which required disaggregation of interindustry-employment requirements into occupational manpower demands by each industry.

#### B. From Interindustry-Employment Demands to Occupation Manpower Requirements

The third basic component of the empirical model, the industry-occupation matrix, translates total interindustry employment demands into occupational manpower requirements. The rows of this matrix represent industries, the columns of this matrix represent occupations, and a coefficient of this matrix indicates for the year in question the percentage of the total employment in the industry in each census occupation.<sup>6</sup>

Industry-occupation matrices have been developed by the Bureau of Labor Statistics from decennial population census data for 1960 and data projected for 1975.<sup>7</sup> The Bureau of Labor Statistics industry-occupation matrix

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<sup>5</sup>Continuing research on this and other components of the model is being conducted by the Economic Research Group of the Center for Advanced Computation, University of Illinois at Urbana-Champaign.

<sup>6</sup>This matrix is discussed further in Chapters 3 and 7 of Bezdek [5].

<sup>7</sup>See U.S. Department of Commerce, Bureau of the Census [57], and U.S. Department of Labor, Bureau of Labor Statistics [73].

for 1975 was the basic source of data used to construct the industry-occupation matrix utilized in our estimates for 1976. Implicitly involved was the assumption that the occupational composition of industrial employment changes very little in the course of one year. All available evidence strongly indicates that this assumption is reasonable and valid.

Development of an industry-occupation matrix for 1972 presented a greater problem. While the matrix derived for 1975/76 could also have been used for 1972, this seemed unwise. Even though most industry-occupation coefficients may be assumed to be relatively stable over a three or four year period, sufficient variation may take place in some of these coefficients--especially in selected critical industries advancing rapidly--to distort the results generated here. So, instead, a separate industry-occupation matrix was derived for 1972 by taking into account the trends of the past decade (as reported by census and the Bureau of Labor Statistics) and by adjusting for more recent trends indicated by contemporary data.<sup>8</sup>

After the industry-occupation matrices for 1972 and 1976 had been created there remained one last obstacle to the completion of the manpower demand generating system. A lack of compatibility remained between the industry categories for which employment demands are generated in the interindustry-employment matrix and the industries for which occupational coefficients were available in the industry-occupation matrix. This was due to a number of factors: disagreement between the industry specifications in terms of Standard Industrial Classification Codes, different activity and output concepts, dissimilar employment coverage, unique handling of special sectors, and so forth.

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<sup>8</sup>The underlying productivity indices are given in Appendix II of Bezdek and Scoville [8].



These difficulties are discussed more fully by Bezdek in Manpower Implications of Alternate Patterns of Demands for Goods and Services.<sup>9</sup> The industry classification scheme developed in that study has been used here in modified form to reconcile the industry categories of the two matrices. The numbers and titles of these "reconciled" industry categories and their specification in terms of the Standard Industrial Classification Codes are given in Table 4-1. The industry classifications listed in this table form the link between categories of the interindustry-employment matrix and those of the industry-occupation matrix, permitting the closing of the entire system.

With dissimilar industries in the two matrices reconciled, interindustry-employment demands could be disaggregated into occupational manpower requirements. For our study overall employment demands were translated into demands for 185 occupational categories which, with their employment in 1960 and Bureau of Labor Statistics projection for 1975, are given in Table 4-2.

A note of caution should be interjected with regard to the meaning and nature of the occupational classifications employed. The occupational data themselves are subject to a number of possible response errors, as they are based on household responses taken by the census. More important, the classification scheme is neither in concept nor in practice exactly congruent with our needs. The conceptual basis for the classification is "social-economic status," which is only roughly linked to the job performed by the individual and to the requisite skills. In practice, particularly at the intermediate level, each of the 185 occupations contains a variety of jobs performed that are heterogeneous. This further weakens the link between changing employment

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<sup>9</sup>See Chapters 6 and 11 of Bezdek [5].

Table 4-1

## Specification of Reconciled Industry Categories

Reconciled Industry Category Title and Number <sup>a</sup>	Related SIC Codes <sup>b</sup>
1. Agriculture, forestry and fisheries	A: 01, 02, 07, 08, 09; except 0722
2. Agricultural products	01, 02
3. Agricultural services, forestry and fisheries	07, except 0722, 08, 09
4. Mining	B: 10, 11, 12, 13, 14; except 138
5. Metal Mining	10
6. Coal Mining	11, 12
7. Crude petroleum and natural gas	131, 132
8. Quarrying and nonmetallic mining	14
9. Construction	C: 15, 16, 17, and 138
10. Manufacturing	D: 19-39
11. Food and kindred products	20
12. Tobacco manufactures	21
13. Textile mill products	22, except 225
14. Broad and narrow fabrics, yarn and thread mills	221, 222, 223, 224, 226, 228
15. Miscellaneous textile goods and floor coverings	227, 229
16. Apparel and related products	23, 225, 239, 3992
17. Apparel	23 (except 239), 225, 3992
18. Miscellaneous fabricated textile products	239
19. Lumber and wood products, except furniture	24
20. Furniture and fixtures	25
21. Paper and allied products	26
22. Paperboard containers and boxes	265
23. All other paper products	261, 262, 263, 264, 266
24. Printing and publishing	27
25. Chemicals and allied products	28 (except 28195)
26. Chemicals, plastics, and drugs	281 (except 28195), 282, 283, 284 286, 287, 289
27. Paints and allied products	285
28. Petroleum refining and related industries	29
29. Rubber and miscellaneous plastic products	30
30. Leather and leather products	31



Table 4-1 (cont'd)

Reconciled Industry Category Title and Number <sup>a</sup>	Related SIC Codes <sup>b</sup>
31. Stone, clay, and glass products	32
32. Glass and glass products	321, 322, 323
33. Stone and clay products	324-329
34. Primary metals industries	33, 38195
35. Primary iron and steel manufacturing	331, 332, 3391, 3399
36. Primary nonferrous metal manufacturing	28195, 333-336, 3392
37. Fabricated metal products and ordnance	19, 34
38. Machinery, except electrical	35
39. Farm machinery and equipment	352
40. Office computing and accounting machines	357
41. Miscellaneous nonelectrical machinery	351, 353-356, 358, 359
42. Electrical machinery, equipment, and supplies	36
43. Transportation equipment	37
44. Motor vehicles and equipment	371
45. Aircraft and parts	372
46. Other transportation equipment	373, 374, 375, 379
47. Professional, scientific, controlling, optical, ophthalmic, and photographic equipment and supplies	38
48. Miscellaneous manufacturing	39 (except 3992)
49. Transportation, communication and public utilities	E: 40-49
50. Transportation and warehousing	40, 41, 42, 44-47
51. Communications	48
52. Radio and television broadcasting	483
53. Other communications	481, 482, 489
54. Electric, gas, water, and sanitary services	49
55. Wholesale and retail trade	50, 52-59, and part of 7399
56. Finance, insurance, and real estate	G: 60-67 (except 6541 and part of 6561)
57. Services, except private household	(Consolidation of SIC groupings contained in next 5 industrial categories)

Table 4-1 (cont'd)

Reconciled Industry Category Title and Number <sup>a</sup>	Related SIC Codes <sup>b</sup>
58. Hotels and lodging places, personal and repair services, except automobile repair	70, 72, 76 (except 7694, 7699)
59. Business services	6541, 73 (except 7361 and part of 7399), 7694, 7699, 81, 89 (except 8921)
60. Automobile repair and services	75
61. Amusements	78, 79
62. Medical and educational services and nonprofit organizations	0722, 7361, 80, 82, 84, 66, 8921
63. Private household services	88
64. Government	J: 91-93
65. Federal government enterprises and administration	91
66. State and local government enterprises and administration	92, 93

<sup>a</sup>Refers to titles and numbers of the industry categories used to reconcile the interindustry-employment industries with those contained in the industry-occupation matrix.

<sup>b</sup>Standard Industrial Classification Codes, 1957 Edition.

Source: Manpower Implications of Alternate Patterns of Demand for Goods and Services [5].

Table 4-2  
Occupational Employment: 1960 and Projected 1975

Occupation Title and Number *	Employment (in thousands)	
	1960	1975
1. Professional Technical, Kindred	7,475	12,924
2. Engineers, Technical	810	1,450
3. Engineers, Aeronautical	46	69
4. Engineers, Chemical	40	62
5. Engineers, Civil	146	248
6. Engineers, Electrical	175	320
7. Engineers, Industrial	83	170
8. Engineers, Mechanical	154	255
9. Engineers, Metallurgical, etc.	20	33
10. Engineers, Mining	14	15
11. Other Engineers, Technical	133	279
12. Natural Scientists	236	465
13. Chemists	91	175
14. Agricultural Scientists	30	53
15. Biological Scientists	30	64
16. Geologists, Geophysicists	18	29
17. Mathematicians	21	51
18. Physicists	24	58
19. Other Natural Scientists	22	35
20. Technicians, except Medical and Dental	731	1,418
21. Draftsmen	233	375
22. Surveyors	44	82
23. Air Traffic Controllers	12	13
24. Radio Operators	17	27
25. Technicians, Other	425	920
26. Medical, Other Health Workers	1,321	2,240
27. Dentists	87	125
28. Dietitians, Nutritionists	27	37
29. Nurses, Professional	496	860
30. Optometrists	17	20
31. Osteopaths	13	16
32. Pharmacists	114	126
33. Physicians and Surgeons	221	374
34. Psychologists	17	40
35. Technicians, Medical and Dental	141	393
36. Veterinarians	19	26
37. Other Medical, Health Workers	171	223
38. Teachers	1,945	3,063
39. Teachers, Elementary	978	1,233
40. Teachers, Secondary	603	1,100
41. Teachers, College	206	455
42. Teachers, Other	158	275
43. Social Scientists	46	79
44. Economists	17	31
45. Statisticians and Actuaries	23	36

Table 4-2 (cont'd)

Occupation Title and Number *	Employment (in thousands)	
	1960	1975
46. Other Social Scientists	6	12
47. Other Professional, Technical, and Kindred	2,386	4,210
48. Accountants and Auditors	429	660
49. Airplane Pilots, Navigators	29	55
50. Architects	30	45
51. Workers in Arts and Entertainment	470	774
52. Clergymen	200	240
53. Designers, except Design Draft	66	116
54. Editors and Reporters	100	128
55. Lawyers and Judges	225	320
56. Librarians	80	130
57. Personnel and Labor Relations Workers	100	191
58. Photographers	51	57
59. Social and Welfare Workers	105	218
60. Professional, Technical, and Kindred, Not elsewhere classified	502	1,276
61. Managers, Officials, Proprietors	7,067	9,035
62. Conductors, Railroad	43	44
63. Creditmen	50	89
64. Officers, Pilots, Engineers--Ship	35	36
65. Postmasters and Assistants	39	34
66. Purchasing Agents	115	164
67. Managers, Office, Proprietors, Not elsewhere classified	6,785	8,667
68. Clerical and Kindred Workers	9,783	14,762
69. Stenographers, Typists, Secretaries	2,386	3,900
70. Office Machine Operators	375	700
71. Other Clerical, Kindred Workers	7,022	10,162
72. Accounting Clerks	383	470
73. Bookkeepers, Hand	667	900
74. Bank Tellers	127	263
75. Cashiers	479	973
76. Mail Carriers	206	290
77. Postal Clerks	243	340
78. Shipping, Receiving Clerks	325	365
79. Telephone Operators	355	452
80. Clerical and Kindred, Not elsewhere classified	4,238	6,109
81. Sales Workers	4,401	5,906
82. Craftsmen, Foremen and Kindred	8,560	11,357
83. Construction Craftsmen	2,554	3,102
84. Carpenters	832	900
85. Brickmasons and Tile Setters	186	228

Table 4-2 (cont'd)

Occupation Title and Number *	Employment (in thousands)	
	1960	1975
86. Cement, Concrete Finishers	46	75
87. Electricians	360	450
88. Excavating, Grading Machine Operators	245	335
89. Painters and Paperhangers	416	455
90. Plasterers	50	61
91. Plumbers and Pipefitters	304	425
92. Roofers and Slaters	50	69
93. Structural Metalworkers	65	105
94. Foremen, Not elsewhere classified	1,137	1,605
95. Metalworking Crafts, except Mechanics	1,081	1,208
96. Machinists and Related Occupations	491	504
97. Blacksmiths, Forgemen, Hammermen	34	24
98. Boilermakers	24	27
99. Heat Treaters, Annealers	20	22
100. Millwrights	69	88
101. Molders, Metal, except Core-makers	54	56
102. Patternmakers, Metal, Wood	40	49
103. Rollers and Roll Hands	32	34
104. Sheet Metal Workers	137	183
105. Toolmakers and Diemakers	180	221
106. Printing Trades Craftsmen	302	330
107. Compositors, Typesetters	183	155
108. Electrotypers, Stereotypers	9	5
109. Engravers except Photoengravers	11	15
110. Photoengravers, Lithographers	24	55
111. Pressmen, Plate Printers	75	100
112. Transport and Public Utilities Craftsmen	374	457
113. Linemen and Servicemen	286	400
114. Locomotive Engineers	47	50
115. Locomotive Firemen	42	7
116. Mechanics and Repairmen	2,017	3,174
117. Airplane Mechanics and Repairmen	112	139
118. Motor Vehicle Mechanics	679	940
119. Office Machine Mechanics	51	104
120. Radio and Television Mechanics	103	140
121. Railroad and Car Shop Mechanics	39	41
122. Other Mechanics and Repair	1,033	1,810
123. Other Craftsmen and Kindred	1,096	1,436
124. Bakers	103	97
125. Cabinetmakers	66	75
126. Crane, Derrick, Hoist Men	124	172
127. Glaziers	16	30

Table 4-2 (cont'd)

Occupation Title and Number *	Employment (in thousands)	
	1960	1975
128. Jewelers and Watchmakers	37	39
129. Loom Fixers	25	24
130. Opticians, Lens Grinders	20	25
131. Inspectors, Log and Lumber	20	25
132. Inspectors, Other	96	141
133. Upholsterers	59	78
134. Craftsmen and Kindred, Not elsewhere classified	531	730
135. Operators and Kindred Workers	11,986	14,806
136. Drivers and Deliverymen	2,375	3,332
137. Drivers, Bus, Truck, Tractor	1,774	2,325
138. Deliverymen and Routemen	601	845
139. Transportation and Public Utility Operators	156	162
140. Brakemen and Switchmen-Railroad	103	111
141. Power Station Operators	21	24
142. Sailors and Deckhands	32	27
143. Semiskilled Metalworking	1,453	1,828
144. Furnacemen, Smeltmen, Poyers	52	56
145. Heaters, Metal	7	9
146. Welders and Flame-Cutters	355	575
147. Assemblers, Metalworking, Class A	101	140
148. Assemblers, Metalworking, Class B	468	545
149. Inspectors, Metalworking, Class B	179	210
150. Machine Tool Operators, Class B	259	256
151. Electroplaters	12	15
152. Electroplaters Helpers	20	22
153. Semiskilled Textile Occupations	780	939
154. Knitters, Loopers, Toppers	44	44
155. Spinners, Textile	50	31
156. Weavers, Textile	61	41
157. Sewers and Stitchers, Manufacturing	625	824
158. Other Operatives and Kindred	7,222	8,707
159. Absbestos, Insulation Workers	20	29
160. Attendants, Auto Service, Parking	380	520
161. Blasters and Powdermen	5	6
162. Laundry, Dry Cleaning Operatives	392	450
163. Meat Cutters, except Meat Packing	190	223
164. Mine Operators, Laborers, Not included elsewhere	281	200



Table 4-2 (cont'd)

Occupation Title and Number *	Employment (in thousands)	
	1960	1975
165. Operatives and Kindred, Not included elsewhere	5,954	7,280
166. Service Workers	8,349	12,740
167. Private Household Workers	2,216	2,700
168. Protective Service Workers	766	1,183
169. Firemen	148	250
170. Guards, Watchmen, Doorkeepers	331	415
171. Police, Other Law Enforcement Officers	287	518
172. Food Service Workers	1,737	2,638
173. Bartenders	172	233
174. Cooks, Except Private Household	557	860
175. Counter and Fountain Workers	158	320
176. Waiters and Waitresses	850	1,225
177. Other Service Workers	3,630	6,219
178. Airline, Stewards, Stewardesses	13	32
179. Attendants, Hospital, Other Institutional	450	1,083
180. Charwomen and Cleaners	200	372
181. Janitors and Sextons	625	980
182. Nurses, Practical	225	465
183. Service Workers, Not included elsewhere	2,117	3,287
184. Laborers, Except Farm and Mine	3,665	3,778
185. Farmers and Farm Workers	5,395	3,352
Total, All Occupations	66,681	88,660

\* Occupations for which manpower demands are generated in this report.

Source: U.S. Department of Labor, Bureau of Labor Statistics [72], [73], and [74].



patterns and the implied need for changes in the patterns of education, training, and acquisition of skills.<sup>10</sup>

### C. The Complete, Consistent Empirical Manpower Demand Generating Model

With the development and integration of the industry occupation matrices the construction of the empirical manpower model was complete. Two distinct sets of the needed matrices were developed: one for 1972 and one for 1976. For the appropriate year, each set generates direct industrial output demands from specified distributions of economic expenditures corresponding to different national priorities, transforms direct output requirements into direct and indirect interindustry-employment demands, and then disaggregates interindustry-employment demands into demands for specific occupations. The models are general, comprehensive, and consistent and contain no double-counting or overlapping. They account for total gross national product and national expenditures, total net (and gross) industrial output, and total industrial and occupational employment.

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<sup>10</sup>For a discussion of difficulties with the occupational information, see Scoville [50]. A conceptual framework more closely aligned with these needs is proposed in [51].

## CHAPTER V. THE MANPOWER IMPACTS OF COUNTERBUDGET

### A. Derivation of Control Data

After the basic components of the models for 1972 and 1976 had been formulated and the appropriate expenditure estimates for those years had been derived and deflated the manpower effects of the Urban Coalition's reorderings could be simulated and analyzed. In the process of generating these results, however, it was important that the intermediate results generated at each stage of the analysis be checked against control data obtained from outside sources. This would indicate the overall accuracy of each component of the system and any serious errors in individual coefficients or parameter estimates.

Of course, many types of control information were included in the original development of the systems: most of the coefficients for each component of the models were derived from independent sources, as were the expenditure and price deflator estimates. Nevertheless, it was necessary to adhere to additional control information as well. The general economic framework within which the manpower models for 1972 and 1976 were developed consists of projections of broad economic aggregates for the period 1971-1976 followed by the Urban Coalition's development of their counterbudget. The projected estimates of gross national product, personal income, corporate profits, employment, and other economic variables used by the Urban Coalition are presented in Table 5-1.

The information given in this table while useful in indicating the level of performance of the economy assumed by the Urban Coalition, is not detailed enough to be a useful control. The first detailed estimates generated

Table 5-1  
Economic Assumptions <sup>a</sup>

	1971	1972	1973	1974	1975	1976
Gross National Product in billions	1,004	1,094	1,190	1,288	1,388	1,489
GNP Price Deflator	100.0	103.3	106.5	109.7	113.0	116.4
GNP Real Growth Rate	5.6%	5.5%	5.0%	4.7%	4.3%	
Personal Income, excluding Transfers, in billions	737	801	870	940	1,012	1,085
Corporate Profits, Before Taxes, in billions	80	88	107	129	146	156
Number Employed, in millions <sup>b</sup>	86.5	88.6	91.1	93.3	94.7	96.3
Number Unemployed, in millions	4.3	3.8	3.5	3.3	3.3	3.4
Unemployment Rate <sup>c</sup>	5.6%	5.0%	4.0%	3.5%	3.5%	3.5%
Consumer Price Index	100.0	104.1	108.2	112.3	116.6	121.0
Wholesale Price Index	100.0	102.3	104.3	106.2	108.1	110.1
Population, in millions, as of July 1	207	209	211	213	215	218

<sup>a</sup>These are the basic economic assumptions which guided the development of the Urban Coalition's estimates of outlays and revenues and its estimates of the economic impact of government activities. In general, these are Urban Coalition staff estimates based upon official projections, such as those issued by the Council of Economic Advisers, the Bureau of Labor Statistics, the Bureau of the Census, and other accepted economic experts.

<sup>b</sup>Excluding members of the Armed Forces.

<sup>c</sup>The unemployment projections take into consideration the impact of the Urban Coalition's recommended public-service employment program described in Chapter 2 of Counterbudget [4].

directly by the manpower models from alternate expenditure distributions are for total final demand in 1972 and 1976. However, comparison of these total direct output requirements generated by the models for 1972 and 1976 was, for most purposes, made impossible by the combination of two factors: the number of special conventions followed in the development of the activity and expenditure categories used here, and the unavailability of alternate projected total final demand distributions based on the same economic assumptions. Thus, while comparison of the total final demand estimates generated here with those available from outside sources did support the general validity of our approach, more detailed or significant conclusions could not be drawn from this comparison.

The second major set of estimates generated by the manpower models employed here is total employment by industry. Industrial employment estimates in the desired 80-order industry detail are available from the Bureau of Labor Statistics for recent years and have been projected by the Bureau of Labor Statistics to 1980. However, detailed industry employment projections for 1972 and 1976 are not readily available and had to be derived for this study other data. Essentially, industry employment projections for these two years were approximated by taking into account each industry's employment trends for the past decade, projected rate of change in employment for the coming decade, the total employment projections developed by the Bureau for 1980, the most recent data indicating the behavior of employment in these industries, and several other factors.<sup>1</sup> In general, the employment estimates for 1972 and 1976 were developed to be consistent with the Bureau of Labor Statistics projections; however, where appropriate adjustments were made in the projected employment

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<sup>1</sup>These interpolated Bureau of Labor Statistics' industry employment estimates are given in Bezdek and Scoville [8].

trends for individual industries. In this study, the employment estimates were used as controls against which to compare the employment estimates initially simulated here, and the employment estimates for 1972 and 1976 were used as well to generate occupational employment for these two years.

#### B. Simulating the Manpower Impacts

Derivation of the control data made possible the comparison of initial output estimates generated by our model to those available from outside sources and permitted the final adjustment of selected coefficients within our models. When this had been accomplished it was possible to simulate in a completely straightforward manner the manpower effects for 1972 and 1976 of the Urban Coalition's recommended national priority reordering.

Four sets of occupational manpower demands for 1972 were generated for comparison and analysis here. The demands generated for professional and technical occupations are given in Table 5-2. In Table 5-2 two sets of occupational manpower requirements were generated directly from industry employment demands--these are the occupational employment requirements given in columns one and five and these are the occupational manpower demands implied by the industry employment totals for 1972 and 1976 derived from actual and projected Bureau of Labor Statistics industry employment estimates. The manpower demands shown in columns two and three of Table 5-2 are the total professional and technical manpower requirements which would be generated by national expenditures distributed according to the Urban Coalition's recommendations and, alternately, by the administration's proposed budget recommendations. Aside from the total occupational employment requirements generated comprehensively by all public and private expenditures, estimates were also derived of the occupational

Table 5-2

Generated Occupational Manpower Demands for Professional and Technical Occupations <sup>a</sup>

Occupation Number and Title	BLS b	1972				1976			
		UC		Administration		UC		UC	
		Total Nat'l Expend. c	Total Nat'l Expend. d	Fed. Govt. Expend. f	BLS b	Total Nat'l Expend. c	Total Nat'l Expend. c	Fed. Govt. Expend. e	
1. Professional Technical, Kindred	11,996,473	12,670,995	12,560,315	2,511,111	13,113,868	15,233,372	4,288,996		
2. Engineers, Technical	1,338,968	1,381,105	1,388,136	299,383	1,446,295	1,494,561	316,340		
3. Engineers, Aeronautical	63,811	65,152	66,825	27,069	66,741	62,435	25,226		
4. Engineers, Chemical	55,108	57,919	58,014	9,757	58,256	55,840	11,648		
5. Engineers, Civil	271,019	285,408	283,142	43,378	301,077	334,349	56,148		
6. Engineers, Electrical	278,783	286,795	289,615	71,107	301,752	273,184	69,080		
7. Engineers, Industrial	149,328	153,838	155,140	31,092	160,477	152,264	30,569		
8. Engineers, Mechanical	229,858	235,806	238,336	54,323	247,272	231,583	53,483		
9. Engineers, Metallurgy, etc.	28,999	29,595	29,833	6,015	30,310	28,067	5,538		
10. Engineers, Mining	18,368	19,254	19,245	3,050	18,511	20,065	3,412		
11. Other Engineers, Technical	237,482	246,065	246,716	53,413	260,365	254,962	60,888		
12. Natural Scientists	398,684	419,019	418,513	47,018	431,505	457,917	130,188		
13. Chemists	136,680	143,974	143,854	26,253	146,173	146,102	34,754		
14. Agricultural Scientists	56,257	59,181	59,112	14,707	60,272	69,341	17,532		
15. Biological Scientists	49,924	52,749	52,482	11,636	55,139	61,817	16,989		



Table 5-2 (cont'd)

Occupation Number and Title	BLS b	1972				1976			
		UC		Administration		UC		UC	
		Total Nat'l Expend. c	Total Nat'l Expend. d	Fed. Govt. Expend. f	BLS b	Total Nat'l Expend. c	Total Nat'l Expend. c	Fed. Govt. Expend. e	
16. Geologists, Geophysicists	32,257	33,847	33,824	6,690	33,687	37,384	37,384	7,868	
17. Mathematicians	40,794	42,264	42,469	11,707	44,564	44,403	44,403	13,004	
18. Physicists	32,965	34,053	34,359	11,364	35,928	35,338	35,338	12,671	
19. Other Natural Scientists	24,782	25,985	26,044	9,957	26,865	28,049	28,049	10,323	
20. Technicians, except Medical, Dental	1,256,163	1,307,166	1,308,434	264,435	1,365,928	1,373,849	1,373,849	295,240	
21. Draftsmen	350,902	363,128	364,106	66,496	387,367	380,265	380,265	73,688	
22. Surveyors	81,402	85,716	84,658	11,124	85,818	96,065	96,065	14,045	
23. Air Traffic Controllers	12,811	13,131	13,434	10,229	13,091	13,929	13,929	10,839	
24. Radio Opera- tors	26,012	27,469	27,235	2,993	28,784	32,868	32,868	3,967	
25. Technicians, Other	785,036	817,722	819,001	176,742	850,868	850,722	850,722	204,696	
26. Medical, Other									
Health Workers	2,151,112	2,313,167	2,263,876	537,809	2,299,343	2,772,494	2,772,494	1,212,993	
27. Dentists	120,070	129,556	126,590	31,723	130,110	160,816	160,816	70,357	
28. Dieticians, Nutritionists	34,861	37,455	36,674	8,930	39,237	47,194	47,194	21,100	
29. Nurses, Pro- fessional	838,396	902,952	883,334	213,590	869,443	1,065,937	1,065,937	490,544	
30. Optometrists	19,512	21,028	20,546	5,046	20,948	25,420	25,420	11,612	
31. Osteopaths	15,450	16,686	16,294	4,088	16,518	20,463	20,463	9,923	
32. Pharmacists	121,720	129,621	126,838	27,419	133,283	143,220	143,220	39,186	
33. Physicians and Surgeons	358,214	385,858	377,476	92,379	390,020	478,911	478,911	220,748	
34. Psychologists	30,451	32,431	31,930	5,151	35,023	41,753	41,753	11,609	
35. Technicians, Medical and Dental	371,683	400,458	391,771	98,240	404,624	496,489	496,489	234,078	



Table 5-2 (cont'd)

Occupation Number and Title	1972					1976		
	BLS <sup>b</sup>	UC		Administration		BLS <sup>b</sup>	UC	
		Total Nat'l Expend. c	Total Nat'l Expend. d	Fed. Govt. Expend. f	Total Nat'l Expend. c		Fed. Govt. Expend. e	
36. Veterinarians	24,102	25,789	25,403	5,732	26,661	32,127	13,815	
37. Other Medical, Health Workers	216,661	232,667	228,311	54,645	233,476	286,025	131,525	
38. Teachers	2,845,227	3,069,306	3,000,163	745,256	3,160,302	3,901,370	1,837,557	
39. Teachers, Elementary	1,149,061	1,240,894	1,211,773	303,622	1,258,186	1,558,362	754,179	
40. Teachers, Secondary	987,716	1,068,091	1,043,145	263,228	1,141,010	1,412,858	685,451	
41. Teachers, College	443,006	478,462	467,209	117,221	469,981	582,223	282,331	
42. Teachers, Other	265,444	284,036	279,563	63,688	291,125	350,478	128,506	
43. Social Scientists	85,119	89,160	89,025	22,750	93,303	98,725	28,138	
44. Economists	30,760	32,120	32,125	8,769	33,770	35,019	10,418	
45. Statisticians and Actuaries	41,832	43,871	43,741	9,584	45,774	41,122	11,922	
46. Other Social Scientists	12,687	13,359	13,324	4,116	14,020	16,160	5,564	
47. Other Professional, Technical and Kindred	3,923,164	4,139,048	4,105,083	668,124	4,319,946	4,802,920	1,062,537	
48. Accountants and Auditors	745,108	781,201	777,454	136,861	829,714	872,146	178,138	
49. Airplane Pilots and Navigators	48,424	51,034	50,870	8,438	50,731	50,345	9,643	
50. Architects	44,970	47,009	46,723	8,099	52,912	55,174	12,399	
51. Workers in Arts, Enter- tainment	736,577	781,620	772,238	137,375	799,043	944,120	263,531	
52. Clergymen	231,918	250,479	244,586	61,365	243,168	301,239	89,545	

Occupation Number and Title	1972				1976			
	BLS b	UC		Administration		UC		
		Total Nat'l Expend. c	Total Nat'l Expend. d	Fed. Govt. Expend. f	BLS b	Total Nat'l Expend. c	Fed. Govt. Expend. e	
53. Designers, except Design Draft	98,818	102,641	102,503	16,590	108,756	107,793	19,980	
54. Editors and Reporters	119,844	128,404	127,857	19,568	131,933	142,412	27,257	
55. Lawyers and Judges	309,417	325,139	321,789	46,916	328,395	351,895	61,458	
56. Librarians	118,000	126,691	124,241	31,146	138,750	167,765	75,934	
57. Personnel and Labor Relation Workers	180,348	189,739	188,501	27,254	200,400	227,772	36,022	
58. Photographers	62,866	66,280	66,128	10,290	68,935	71,294	13,793	
59. Social and Welfare Workers	197,811	209,869	207,123	12,551	231,606	280,711	26,984	
60. Professional, Technical, Kindred, Not elsewhere classified	1,029,093	1,083,476	1,077,108	210,011	1,135,603	1,228,559	328,913	

<sup>a</sup>These results for all 185 occupational manpower categories may be found in Bezdek and Scoville [8].

<sup>b</sup>Refers to the occupational manpower demands implied by modified versions of the Bureau of Labor Statistics' projections of industrial employment requirements for the appropriate year.

<sup>c</sup>Refers to the total occupational manpower demands generated by all public and private expenditures as distributed according to the Urban Coalition's priorities for the appropriate year.

<sup>d</sup>Refers to the total occupational manpower demands generated by all public and private expenditures as distributed according to the administration's priorities for 1972.

<sup>e</sup>Refers to the occupational manpower demands generated directly and indirectly by Federal government expenditures as distributed according to the Urban Coalition's priorities for the appropriate year.

<sup>f</sup>Refers to the occupational manpower demands generated directly and indirectly by Federal government expenditures as distributed according to the administration's priorities for 1972.

demands generated exclusively by Federal budget outlays. These estimates for 1972 for the administration's proposed outlays are given in column four of Table 5-2. Finally, columns six and seven indicate the occupational distribution stemming from total GNP and from Federal outlays in 1976, assuming adoption of Counterbudget.

By analyzing and interpreting the results presented in Table 5-2, the absolute and percentage differences in requirements for detailed occupational categories can be derived. This information is presented in Table 5-3 where the differences in requirements which would result from each distinct set of assumptions used here are given: three alternate sets of occupational employment requirements are given for 1972, and one set is given for 1976. Finally, the percentage of total professional and technical manpower demands generated directly and indirectly by alternate Federal government expenditures in 1972 and 1976 is presented in Table 5-4.

Several explanatory observations may clarify the contents of the tables. In the first place, both the Urban Coalition budget and the Administration budget yield overall levels of employment about 5% greater than for our Bureau of Labor Statistics simulation for 1972. This difference stems in part from the procedures used to interpolate the Bureau of Labor Statistic projections to fit 1972 and 1976, which makes both the Urban Coalition and the Administration more "optimistic" about the total level of economic activity and of employment. Thus, the principal comparison of interest for 1972 is that between the simulations of the Administration budget and those of Counterbudget.

Second, a note must be attached to the interpretation of the levels of employment generated by Federal expenditures, shown in Tables 5-2 and 5-4.

Table 5-3

Differences in Generated Demands for Professional and Technical Manpower <sup>a</sup>

Occupation Title and Number	1972				1976			
	BLS and UC <sup>b</sup>		BLS and Administration <sup>c</sup> and UC <sup>d</sup>		BLS and UC			
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
1. Professional Technical, Kindred	685,498	5.72	564,107	4.70	109,489	0.88	1,470,963	10.95
2. Engineers, Technical	47,137	3.53	54,168	4.06	-7,031	-0.51	-31,684	-2.19
3. Engineers, Aeronautical	1,341	2.10	3,014	4.72	-1,673	-2.50	-4,306	-6.45
4. Engineers, Chemical	2,811	5.10	2,906	5.27	-95	-0.16	-2,416	-4.15
5. Engineers, Civil	14,389	5.31	12,123	4.47	2,266	0.80	33,272	11.05
6. Engineers, Electrical	8,012	2.87	10,832	3.89	-2,820	-0.97	-28,568	-9.47
7. Engineers, Industrial	4,515	3.02	5,817	3.90	-1,302	-0.84	-8,213	-5.12
8. Engineers, Mechanical	5,948	2.59	8,478	3.69	-2,530	-1.06	-15,689	-6.34
9. Engineers, Metallurgy etc.	540	1.86	834	2.88	-294	-0.99	-2,233	-7.37
10. Engineers, Mining	891	4.85	882	4.80	9	0.05	1,554	8.40
11. Other Engineers, Technical	8,583	3.61	9,234	3.89	-651	-0.26	5,403	2.08
12. Natural Scientists	20,335	5.10	19,829	4.97	506	0.12	26,412	6.12
13. Chemists	7,294	5.34	7,173	5.25	121	0.08	-71	-0.05
14. Agricultural Scientists	2,924	5.20	2,855	5.07	69	0.12	9,069	15.05
15. Biological Scientists	2,825	5.66	2,558	5.12	267	0.51	6,678	12.11
16. Geologists, Geophysicists	1,590	4.93	1,567	4.86	23	0.07	3,697	10.97
17. Mathematicians	1,470	3.60	1,675	4.11	-205	-0.48	-162	-0.36
18. Physicists	1,088	3.30	1,394	4.23	-333	-0.99	-590	-1.64
19. Other Natural Scientists	1,203	4.84	1,262	5.09	-59	-0.23	1,184	4.41
20. Technicians, Except Medical, Dental	51,003	4.03	52,271	4.18	-1,268	-0.14	7,921	0.58
21. Draftsmen	12,226	3.48	13,204	3.76	-978	-0.27	-7,102	-1.83
22. Surveyors	4,314	5.31	3,256	4.39	762	0.89	10,247	11.94
23. Air Traffic Controllers	320	2.50	623	4.86	-303	-2.25	838	6.38
24. Radio Operators	1,457	5.57	1,222	4.69	234	0.84	4,084	14.19

Table 5-3 (cont'd)

Occupation Title and Number	1972				1976			
	BLS and UC		BLS and Administration <sup>c</sup> and UC <sup>d</sup>		BLS and UC		BLS and UC	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
25. Technicians, Other	32,686	4.16	33,965	4.33	-1,279	-0.16	-146	-0.02
26. Medical, Other Health Workers	162,077	7.53	112,785	5.24	49,292	2.18		20.58
27. Dentists	9,486	7.90	6,520	5.43	2,966	2.38	30,706	23.60
28. Dieticians, Nutritionists	2,594	7.44	1,813	5.20	781	2.13	7,957	20.28
29. Nurses, Professional	64,556	7.70	44,938	5.36	19,617	2.23	196,494	22.60
30. Optometrists	1,516	7.77	1,034	5.27	572	2.38	4,472	21.35
31. Osteopaths	1,236	8.00	843	5.46	393	2.41	3,945	23.88
32. Pharmacists	7,900	6.49	5,117	4.20	2,783	2.10	9,937	7.46
33. Physicians and Surgeons	27,642	7.72	19,260	5.38	8,382	2.22	88,901	22.79
34. Psychologists	1,980	6.50	1,479	4.86	5,04	1.58	6,730	19.22
35. Technicians, Medical, Dental	28,774	7.74	20,086	5.40	8,688	2.22	91,865	22.70
36. Veterinarians	1,687	6.99	1,301	5.40	386	1.52	5,466	20.50
37. Other Medical, Health Workers								
38. Teachers	16,720	7.72	11,646	5.37	5,075	2.22	51,549	22.08
39. Teachers, Elementary	224,014	7.87	154,871	5.44	69,143	2.30		23.45
40. Teachers, Secondary	91,852	7.99	62,731	5.46	29,121	2.40	300,197	23.86
41. Teachers, College	80,396	8.14	55,812	5.61	24,946	2.39	271,856	23.83
42. Teachers, Other	35,452	8.00	24,199	5.46	11,253	2.41	111,217	23.88
43. Social Scientists	18,600	7.01	14,127	5.32	4,473	1.60	59,363	20.39
44. Economists	4,041	4.75	3,906	4.59	135	0.15	5,422	5.81
45. Statisticians and Actuaries	1,360	4.42	1,365	4.44	-5	-0.02	1,249	3.70
46. Other Social Scientists	2,039	4.87	1,909	4.56	130	0.30	1,033	2.44
47. Other Professional, Technical, and Kindred	672	5.30	637	5.02	35	0.26	2,140	15.26
48. Accountants and Auditors	215,596	5.50	181,566	4.63	34,030	0.83	483,851	11.20
49. Airplane Pilots, Navigators	36,093	4.84	32,346	4.34	3,747	0.48	42,432	5.11
50. Architects	2,610	5.39	2,446	5.05	164	0.32	-386	-0.76
51. Workers in Arts, Entertainment	2,039	4.53	1,753	3.90	286	0.61	2,262	4.28
52. Clergymen	45,058	6.12	35,676	4.84	9,382	1.21	145,107	18.16
	18,561	8.00	12,668	5.46	5,892	2.41	58,072	23.88



Table 5-3 (cont'd)

Occupation Title and Number	1972						1976	
	BLS and UC b		BLS and Administration c		and UC d		BLS and UC	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
53. Designers, Except Design Draft	3,823	3.87	3,685	3.73	138	0.13	963	0.89
54. Editors and Reporters	8,560	7.14	8,013	6.69	547	0.43	10,479	7.94
55. Lawyers and Judges	14,516	4.69	12,393	4.00	2,123	0.66	23,504	7.16
56. Librarians	8,690	7.36	6,241	5.29	2,450	1.97	29,019	20.92
57. Personnel and Labor Relations Workers	9,403	5.21	8,166	4.53	1,238	0.66	2,338	11.66
58. Photographers	3,414	5.43	3,262	5.19	152	0.23	2,359	3.42
59. Social and Welfare Workers	12,034	6.08	9,288	4.69	2,746	1.33	49,132	21.22
60. Professional, Technical, Not elsewhere classified	54,383	5.28	48,015	4.69	6,368	0.59	92,956	8.19

<sup>a</sup>These results for all 185 occupational manpower categories may be found in Bezdek and Scoville [8].

<sup>b</sup>(Estimate from Urban Coalition budget) minus (estimate from Bureau of Labor Statistics bills of goods) divided by estimate from Bureau of Labor Statistics bill of goods.

<sup>c</sup>(Estimate from Administration budget) minus (estimate from Bureau of Labor Statistics bill of goods) divided by estimate from Bureau of Labor Statistics bill of goods.

<sup>d</sup>(Estimate from Urban Coalition budget) minus (estimate from Administration budget) divided by estimate from Administration budget.



Table 5-4

Percent of Total Professional and Technical Manpower  
Demands Generated by Federal Expenditures <sup>a</sup>

Occupation Title and Number	1972	1976
	Admin. <sup>b</sup>	U.C. <sup>c</sup>
1. Professional Technical, Kindred	20.00	29.48
2. Engineers, Technical	21.57	22.36
3. Engineers, Aeronautical	40.51	40.40
4. Engineers, Chemical	16.82	20.86
5. Engineers, Civil	15.32	16.79
6. Engineers, Electrical	24.55	25.29
7. Engineers, Industrial	20.04	20.08
8. Engineers, Mechanical	22.79	23.09
9. Engineers, Metallurgical	20.16	19.73
10. Engineers, Mining	15.85	17.00
11. Other Engineers, Technical	21.65	23.88
12. Natural Scientists	23.18	28.43
13. Chemists	18.25	23.79
14. Agricultural Scientists	24.88	25.28
15. Biological Scientists	22.17	27.48
16. Geologists, Geophysicists	19.78	21.05
17. Mathematicians	27.57	29.29
18. Physicists	33.07	35.86
19. Other Natural Scientists	30.55	36.80
20. Technicians, Except Medical, Dental	20.21	21.49
21. Draftsmen	18.26	19.38
22. Surveyors	13.14	14.62
23. Air Traffic Controllers	76.14	77.82
24. Radio Operators	10.99	12.07
25. Technicians, Other	21.58	24.06
26. Medical, Other Health Workers	23.76	43.75
27. Dentists	25.06	47.73
28. Dieticians, Nutritionists	24.35	44.71
29. Nurses, Professional	24.18	46.02
30. Optometrists	24.56	45.68
31. Osteopaths	25.09	48.49
32. Pharmacists	21.62	27.36
33. Physicians and Surgeons	24.47	46.09
34. Psychologists	16.13	27.80
35. Technicians, Medical, Dental	25.08	47.15
36. Veterinarians	22.56	43.01
37. Other Medical, Health Workers	23.93	46.15
38. Teachers	24.84	47.10
39. Teachers, Elementary	25.06	48.40
40. Teachers, Secondary	25.23	48.52
41. Teachers, College	25.09	48.49

Table 5-4 (cont'd)

Occupation Title and Number	1972	1976
	Admin. <sup>b</sup>	U.C. <sup>c</sup>
42. Teachers, Other	22.78	36.67
43. Social Scientists	25.55	28.50
44. Economists	27.30	29.75
45. Statisticians and Actuaries	21.91	28.99
46. Other Social Scientist	30.89	34.43
47. Other Professional, Technical, and Kindred	16.28	22.12
48. Accountants and Auditors	17.60	20.43
49. Airplane Pilots, Navigators	16.59	19.15
50. Architects	17.33	22.47
51. Workers in Arts, Entertainment	17.79	27.91
52. Clergymen	25.09	29.57
53. Designers, Except Design Draft	16.18	18.54
54. Editors and Reporters	15.30	17.03
55. Lawyers and Judges	14.58	17.46
56. Librarians	25.07	45.26
57. Personnel and Labor Relations Workers	14.46	16.10
58. Photographers	15.56	19.35
59. Social and Welfare Workers	6.06	9.61
60. Professional, Technical, Kindred, Not elsewhere classified	19.50	26.77

<sup>a</sup> These results for all 185 occupational manpower categories may be found in Bezdek and Scoville [8].

<sup>b</sup> Percent of total manpower requirements within specified occupational category generated by Federal expenditures distributed in the manner proposed by the administration.

<sup>c</sup> Percent of total manpower requirements within specified occupational category generated by Federal expenditures distributed according to the Urban Coalition's recommendations.

In this context, Federal expenditures are considerably broader than the customary "purchases of goods and services." As was explained in Chapter 3, most transfer payments are included in Federal spending; for example, some personal consumption expenditures attributable to the receipt of social welfare payments are counted as producing federally generated employment. As noted there, only by a convention such as this can a true measure of the whole impact of Federal outlays be obtained.

## CHAPTER VI. INTERPRETATION OF THE RESULTS

### A. Short-run Shifts in 1972

Most of the immediate impacts of Counterbudget in 1972 would be relatively modest, as is best indicated by references to columns 5 and 6 of Table 5-3. In those columns are shown the differences between the job distribution generated by the Administration budget and that resulting from the proposals for 1972 contained in Counterbudget.

The positive effects--from the point of view of those employed--can be quickly summarized. Overall, the Urban Coalition budget creates more jobs than does the Administration proposal; in short, the areas of suggested expansion cost less per job generated than do the areas of contraction (defense in particular). On balance, these reallocations would cause employment to expand by eight tenths of one percent. Stated in this fashion, the effect seems modest enough; but when placed against an unemployment rate likely to be in the vicinity of six percent, it is clear that such additional job creation would be welcome.

This impact would be even slightly larger among the groups which have been harder hit by recent unemployment. Employment of laborers (farm and non-farm) would rise by almost 1%; most service and sales occupations would experience an expansion of 2.3%. This is all to the good.

Some markets which are not so loose would also be tightened. Demand for workers in the health area, professionals as well as paraprofessionals and technicians, would increase across the board by 2% or better. All but a few of the building trades would show increased demand by roughly 1%. It is likely

that these effects would intensify current inflationary pressures in those markets.

As the reader of Counterbudget will have guessed, the burdens of the reallocation will fall most heavily on those whose jobs are linked to military and quasi-military expenditures. Overall, Counterbudget would reduce the need for engineers by .5% in 1972, with greater effects on aeronautical (2.5% loss) and electrical and mechanical (1%) engineers. Mathematicians (off .5%) and physicists (off 1%) would also be hit. The effects extend further down into the labor force. Skilled workers, machinists (1.3%) and tool and die makers (1.6%) would experience significant contractions of demand. Other metal working occupations, both skilled and semi-skilled, would suffer an employment loss of from one to two percent. Airplane mechanics would share that fate as well.

The most important conclusion to be drawn about the immediate impact of Counterbudget for 1972 is probably not economic, but political in nature. Although one is predisposed to regard unemployment among the skilled or professionals as being less onerous, injurious and socially undesirable than further increases in unemployment among the poor, unskilled and the minorities, the group that would be afflicted most by Counterbudget may be powerful enough to pose an obstacle to its adoption. In large part, their power stems from the regional and industrial concentration of present unemployment. Significant increases in the difficulties encountered by workers in these occupations, as implied in the Urban Coalition proposals, would increase the intensity of their opposition. There will clearly be a problem in selling Counterbudget, when its severest consequences are concentrated in a group which is experiencing previously unknown difficulties and which has powerful friends in Congress.

## B. Longer-run Shifts to 1976

Because of the differences in the degree of optimism about the economy built into the Urban Coalition budget and into our simulations of an interpolated Bureau of Labor Statistics bill of national output, it is somewhat misleading to compare the two directly. Nevertheless, given that the Counterbudget would generate total employment 5.09% higher than our Bureau of Labor Statistics simulation, the figures in columns 5 and 6 of Table 5-2 and columns 7 and 8 of Table 5-3, can be used to indicate differences in the levels of occupational demand implied by the two levels and distributions of national output.

An alternative approach may give a better idea of the relationship between supply and demand for various types of manpower. If the Bureau of Labor Statistics forecasts of the U.S. economy to 1980 are considered to be based on changes which are "normal" and within the adaptive capacity of the economy, their estimated manpower implications can be used as rough indicators of the kinds of supply changes expected in various occupational categories. By comparison with this measure, some of the particular strains imposed by Counterbudget can be identified.

Table 6-1 below shows estimates of this difference between normal or trend changes implicit in the Bureau of Labor Statistics forecasts (as interpolated) and the simulations of the Counterbudget proposals for a number of selected occupations. Column 1 shows the immediate shift in 1972 from adoption of the Urban Coalition priorities. Column 2 of the table presents estimates of the changes involved in progressive implementation of Counterbudget to 1976. In column 4 the estimated "Bureau of Labor Statistics normal" change in employment is given. Column 5 summarizes the differential impact of Counterbudget on these selected occupations. It should be noted that these estimates refer to total



Table 6-1

Differential Impact of Counterbudget on Selected Critical Occupations  
(in percent of employment in 1972)

Occupation	Counterbudget Impact			"BLS Normal"	Net Impact
	Immediate 1972 (1)	1972-76 (2)	Total (3)	(4)	(3) - (4)
Engineers	-0.5	2.5	2.0	8.4	-6.4
Aeronautical	-2.5	-4.2	-6.7	4.9	-11.6
Chemical	-0.2	-3.6	-3.8	6.0	-9.8
Civil	0.8	17.1	17.9	11.1	6.8
Electrical	-1.0	-4.8	-5.8	8.2	-14.0
Industrial	-0.8	-0.5	-1.3	7.3	-8.6
Mechanical	-1.1	-8.4	-9.5	7.2	-16.7
Metallurgical	-1.0	-5.1	-6.1	4.5	-10.6
Natural Scientists	0.1	8.5	8.6	8.5	0.1
Agricultural	0.1	17.0	17.1	7.1	10.0
Biological	0.5	17.2	17.7	10.4	7.3
Chemists	0.1	1.4	1.5	6.9	-5.4
Geological	0.1	10.5	10.6	4.3	6.3
Mathematicians	-0.5	5.0	4.5	9.3	-4.8
Physicists	-1.0	3.5	2.5	8.8	-6.3
Technicians, non- medical	-0.1	5.8	5.7	9.3	-3.6
Health Workers	2.2	28.0	30.2	14.4	15.8
Dentists	2.4	32.4	34.8	15.5	19.3
Nurses	2.2	31.0	33.2	15.0	18.2
Physicians	2.2	31.0	33.2	15.7	17.5
Technicians	2.2	31.3	33.5	15.3	18.2
Attendants, Hos- pital	2.3	32.0	34.3	15.3	19.0
Teachers	2.4	32.0	34.4	15.3	19.1
Social Scientists	0.2	10.6	10.8	9.6	1.2
Social Workers	1.3	30.5	31.8	14.3	17.5
Craftsmen	0.4	4.9	5.3	7.1	-1.8
Construction	0.8	10.2	11.0	8.0	3.0
Metalworking	-1.1	-4.4	-5.5	5.9	-11.4
Transport	0.4	-9.2	-8.8	4.3	-13.1
Mechanics	0.7	9.5	10.2	7.8	2.4
Semiskilled Metal- working Occupations	-1.6	-6.8	-8.4	6.0	-14.4

employment--in order to assess the net effects on disemployment or new entry figures on expected attrition through death, reitirement, etc. would be needed.

The first obvious manpower impact of Counterbudget is seen in the troublesome area of the engineering occupations. Among the groups shown, only civil engineers experience an increase in employment and outstrip the implicit Bureau of Labor Statistics trend. Other engineering specialties suffer losses, some of them quite substantial. There is net growth of 2% for all engineers, but this is far less than the amount expected from longer term trends. Thus, the problems of labor market adjustment which confronted this set of occupations in the short run is even more pronounced over the four year span to 1976. These figures strongly suggest that, if Counterbudget were adopted, one of the immediate priorities would be the dissuasion of new entries to these fields (except for civil engineers).

Under Counterbudget, natural scientists as a group would fare as well as the Bureau of Labor Statistics simulations would predict. Various specializations would be affected differently, however. Three of those shown would have greatly increased growth rates, while three would grow much less than previously projected.

Craftsmen would experience similarly diverse impacts, although growing as a whole only slightly less than Bureau of Labor Statistics simulations would suggest. Demand for the inflation-prone construction trades would rise from a normal 8% rise to 11%, and demand for mechanics and repairmen would behave similarly. Transport and metalworking trades, in company with other defense-oriented sectors of the labor market would go from positive to negative growth rates. This effect would be strongly felt by semi-skilled operations in metalworking.

There are three broad areas of work in which the adoption of the Urban Coalition proposals would put a reverse strain on the labor market. Demand for health workers, teachers and social workers could be expected to outrun normal expansion by between 15 and 20% of total 1972 employment. All these occupations would have to expand by over 30% in the next four years. While the market for teachers is undoubtedly loose today, it seems unlikely that there is so much excess supply as to permit this rate of expansion. The same comment, perhaps slightly stronger, could be applied to social workers. But the clearest and most stringent bind will surely be in the implied needs for all classes of health workers, unless we find an alternative solution to the provision of medical services through technological change.<sup>1</sup>

Certainly in the case of medicine, and most probably for teachers and social workers, the goals of Counterbudget are unattainable with technologies largely similar to those we have used for our projections, which are not radically different from the technologies in use today. Our simulation indicates that the productivity of the established medical trades shown in Table 5-6 will have to be substantially increased, most likely through increased utilization of paraprofessionals, rationalization of the use of time by professionals, and the substitution of lower skilled workers for the more routine tasks. Despite current forecasts of widespread unemployment among college graduates of no particular specialty, it is likely that the same diagnosis must be applied to the professions of teaching and social work.

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<sup>1</sup>"...medical occupations would, on the whole, experience an increase in requirements of about 1.5% for all occupational groups. This is clearly an underestimate of the changes in demand that implementation of the Counterbudget would bring, since the report reallocates considerably more resources to the medical areas than Bezdek's example does." (Counterbudget [43], page 307.)

If such reorganizations, rationalization, and new inputs are not developed, then the market will find a way to defeat these particular goals of the Urban Coalition. The real impact and benefit of the shift of Federal expenditures into health care, for example, will be sharply reduced by rising wages and prices in a market as tight as the one we have simulated. Without careful restructuring of that sector before massive infusions of cash, the probably end results would be these: an increase in the provision of health services which would be quite modest in comparison with Counterbudget goals, accompanied by a redistribution of income to the producers in the sector occasioned by the rising level of wages and prices. Finally, if Congress held to the health care goals as measured in real terms, and attempted to offset these effects through appropriation of more funds, the result would be an enormously increased dollar cost of attaining the Counterbudget proposals.

#### C. The Changing Importance and Impact of Federally Generated Employment

The estimates shown in Table 5-4 above indicate the relative importance of Federal spending (and Federal transfers which go from the recipient's pocket into personal consumption) in the generation of employment in specific occupations. As can be seen, the importance of Federal outlays is very different: for some groups it is negligible, for others practically a mainstay of their existence. With the relative expansion of the Federal budget proposed by the Urban Coalition, the overall share of employment which is directly or indirectly generated by Federal spending will rise from 16.5 to 21.0% between 1972 and 1976.

The impacts on various occupations are much more dramatic. The share of Federally generated jobs in medicine and teaching will roughly double as a

result of increased expenditures and the assumption of some costs presently borne directly by the consumer. The importance of these effects can be seen in Table 6-2, which shows the top twelve occupations in terms of importance of Federal money under the Administration budget for 1972 and Counterbudget for 1976.

#### D. Overview

In general, the results of a detailed simulation of Counterbudget, in contrast with other allocations of output, indicate that certain areas of the labor market would be subjected to severe strain. While the immediate effects are generally quite small (despite the concentrated impact on engineering and related employment) and in some cases beneficial, some serious dislocations are implied by full implementation of the Urban Coalition's proposals in 1976. The authors cannot be as optimistic about the manpower impacts as their findings in Chapter 22 of Counterbudget would have suggested. A full analysis of the proposed Federal activities, taking particular account of those areas which were expanded more rapidly than assumed in Bezdek's 1970 paper suggests a need for some caution and for the development of programs to alleviate the most critical problems.

The most serious area in which altered spending patterns, in conjunction with a relatively stable technology, would give rise to unattainable manpower needs is clearly in health services. Whether rationalization of the use of doctors' time and substantial changes in the technology of health care delivery (particularly through greatly expanded use of paramedical workers) can be pursued to an extent necessary to meet the need by 1976 is open to considerable doubt. Although health services is one area where manpower input coefficients might be changed most readily by public policy, it is unlikely that the

Table 6-2

The Top Twelve Federally-Generated Occupations, 1972 and 1976

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<u>1972</u>	<u>1976</u>
1. Air Traffic Controller	Air Traffic Controllers
2. Postal officials and workers	Postal officials and workers
3. Aeronautical Engineers	Osteopaths
4. Airplane mechanics	Dentists
5. Physicists	Medical and dental technicians
6. Social scientists, except statisticians and economists	Teachers
7. Miscellaneous natural scientists	Miscellaneous medical workers
8. Economists	Physicians and surgeons
9. Mathematicians	Nurses
10. Osteopaths	Optometrists
11. Teachers	Librarians
12. Medical and dental technicians	Dieticians

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manpower resources, training facilities, and legal and institutional arrangements can be rearranged swiftly enough to make the Coalition's goals feasible within the allotted time span.

Similar comments apply to the areas of education and social work which would also be in exceedingly short supply. In these areas, there is certainly greater labor market looseness today (perhaps even more to come), the training lead times are generally shorter, and the flexibility for changing inputs is not as encumbered by rules of good practice, liability laws and consumer reluctance as in medicine. These areas do not pose insuperable obstacles to the attainment of Counterbudget's goals.

One final area in which the Coalition's proposals continue to put pressure on already aggravated labor market problems is construction. The impact of program expansions and cutbacks is nearly balanced in Counterbudget, but there would be a modest increase in demand. This increase would increase employment expansion in these trades by roughly half again that implicit in interpolated Bureau of Labor Statistics trends. Although the inflationary impact of this increase may not be precisely predicted, it is certain that an expansion of demand, no matter how small, will not help in current attempts to bring those markets under control. Nevertheless, deseasonalization alone should produce the needed additional manhours without any expansion in the labor force. This is a modest hurdle compared to health care problems.

Finally, the full simulation of Counterbudget indicates that there is a network of jobs, loosely identified as engineering and related occupations, where the proposed new efforts and budget cutbacks do not wash out on balance. From mathematicians to engineers, to technicians, to skilled and semi-skilled workers, a series of negative employment effects is found. Although some other

occupations in the same general areas (e.g., civil engineers) will expand as a result of new programs, the negative effects are strong enough to keep total engineer demand almost unchanged. It is significant that such static markets do not encourage or facilitate the movement of the disemployed to other related occupations. These estimates lend further urgency to the Coalition's porposals for aid to former defense workers in retraining and relocation. Unless such proposals are rapidly developed and implemented, concentration of the short-run impacts of Counterbudget in this already distressed market may prove politically fatal to adoption of the program.

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